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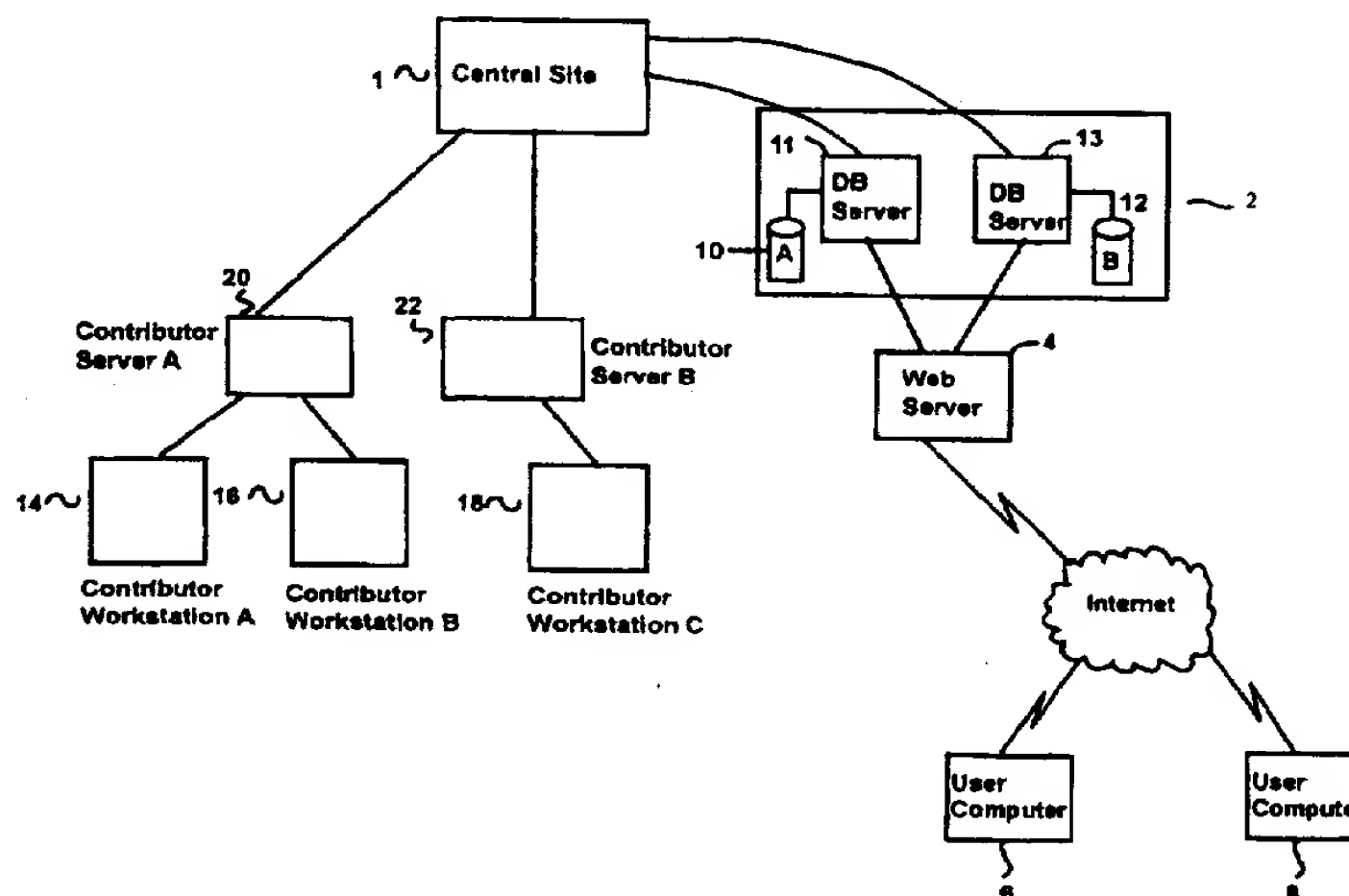
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**(57) Abstract**

The secure electronic distribution of research documents over the world wide web to investors. A repository server (2) receives research documents from contributors (14, 16, 18, 20, 22). Also received are corresponding document profiles with information relating to each research document including authorization information specifying who is permitted to access each research document. The repository server (2) includes a first database (11) for structured query searches and a second database (13) for full text searches. The web server (4) receives requests from investors for research documents that satisfy a query. The web server (4) determines whether the first database (11) or the second database (13) should be searched based upon the type of query. The repository server (2) transmits to the web server (4) a list of research documents that satisfy the query and which the investor is authorized to access according to the authorization information. The web server (4) formats the list of documents according to a template form. Optionally, queries can be optimized.

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INFORMATION DELIVERY SYSTEM AND METHOD

Field of Invention

5 The present invention is directed to a computer-based system and method for the electronic distribution of information, and more particularly, for the distribution of information via the Internet to authorized recipients.

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20 Background of the Invention

Current computer technology allows documents and other information to be distributed electronically, from computer to computer. Electronic distribution is

generally cost effective when compared with hard copy distribution methods. Global computer networks, such as the Internet, enable information to be distributed to a wide range of people at locations around the world. One
5 of the many advantages of the Internet, particularly the World Wide Web ("WWW"), is that the communication protocols used are non-proprietary, thus enabling end users to access and use the Internet without the need for customized hardware or software.

10 Often, an information provider wishes to provide information to users on a controlled basis. For example, the information provider may want to provide information only to those users who have paid a fee or completed a
15 registration process, and also may want to restrict access to certain types of information to certain classes of users. Additionally, the information provider may require that the format of the information provided to one user be different from the format of the same
20 information provided to another user or class of users.

Further, some users only may be interested in certain types of information available from a particular information provider. Users may wish that the
25 information received from an information provider be output in a format specific to that user.

Existing technology allows an information provider who distributes information via the WWW to restrict access to
30 authorized users by means of, for example, a user identification code and/or password. However, current password authorization methods used on the WWW have a number of significant problems. When using a browser program, such as Netscape's Navigator program or
35 Microsoft's Internet Explorer program, to access web pages, a user is simply making a request to a remote web server (having a unique IP address) for a file. This

file is stored in the user's computer local memory and is output by the browser program. Typically, web pages are in HTML format (HyperText Markup Language). Each time the user "moves" to a new web page, the browser program
5 makes a new request to a web server (which may be the same or another web server) for a file. Thus, although a user may provide a password to obtain a file from a web server, the user typically does not log-out when the user has finished with this file -- the user simply issues a
10 request for a file on another web server or closes down his or her browser program.

When a user initially accesses a web server, most browser programs can provide the web server with an
15 identification code identifying the particular browser as well as the user's Internet Protocol ("IP") address. However, when a user accesses a web server through a proxy server, many users may appear to have the same IP address.

20 To prevent concurrent use of a user's identification code and password (e.g., to prevent the user from distributing the user's identification code and password for use by others) when a user initially accesses a web server, the
25 web server, using current password technology, can prevent other access with that identification code for a predetermined period of time. However, if the user moves to another computer or browser program, then the authorized user will be prevented from accessing the web
30 server from the new computer or browser program.

Thus, a secure sign-on procedure is needed that prevents multiple users using the same identification code and allows an authorized user to move to another computer or
35 browser program and still be permitted to access the secure web server.

When providing information via the WWW, information providers can, in a crude way, "customize" the information for a user. One simple example of customization is providing the user with the results of a query. Here, the user submits a query to the web server, e.g., by completing a form, and, based on the user's request, the web server creates a web page (or form) comprising information satisfying the query and transfers this web page (or form) to the user's browser program for display. In such systems, the program used to create the web page (or form) is "hard coded", so that if the information provider wishes to change the format of the information, this program must be recoded or replaced. Recoding or replacing such programs is inefficient and often time consuming.

Further, every user who submits the same query to the web server will receive the same results in the same format. Existing methods of providing information to WWW users do not enable different users to be automatically provided with different views of the information. Thus, a procedure is needed to enable the provision of customized views of requested information to WWW users.

When a user submits a query to a web server, the web server will typically format and submit the received query to a database program or search engine. There can be many types of queries that a user submits via an information provider's web server. For example, some queries may request information based on categories contained in a relational database (e.g., all presidents who were born in Virginia) while other queries may require full text searches of textual documents (e.g., all documents containing the words "sell" and "IBM"). Currently, information providers maintain one database of information that is used to obtain the results of all types of queries. However, while a database search

engine may be fast and efficient in obtaining search results for some types of queries, it may be slow and inefficient in obtaining search results for other types of queries.

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Moreover, when responding to queries via the WWW, the web server is accessed by many users. Due to communication delays over the Internet, it is wasteful to tie-up the database program or search engine until each user has received the full results of the user's query. It would be desirable in some instances to provide a search mechanism that allows asynchronous searching of a database by multiple web users such that the database program or search engine can take advantage of communication delays when serving multiple users.

Thus, in summary, an Internet information delivery system is needed that has a secure but flexible password control mechanism so that information is provided only to users who are authorized to receive it, that efficiently retrieves any requested information, and that customizes the views of information provided to users in a flexible and robust manner.

25 Summary of the Invention

The present invention provides an electronic information distribution system that allows remote users to receive, access and query information that is stored in electronic form at a central server, called a repository server. Ideally, users communicate with the repository server via the Internet. The repository server is coupled to the Internet by a web server. The repository server comprises or is coupled to a plurality of databases of information stored in electronic form.

Preferably, the repository server is coupled to one or

more remote contributor workstations. The information that is stored at the repository server is received from the contributor workstations in electronic form. According to the representative embodiment of the present invention, the information received from the contributor workstations are files comprising one or more documents. These documents typically would contain text, data, charts, graphs, spreadsheets and the like, or combinations thereof, and may be in many formats. It will be appreciated that any information that can be stored in digital form, such as photographs, videos, sound recordings, etc. may be stored in the files received from the contributor workstations. In the representative embodiment, files received from the contributor workstations are converted at a central site into predetermined format, e.g., for printable documents, a common viewing format such as, for example, PDF format, and thereafter provided to the repository server. In the representative embodiment, each document submitted to the repository server is accompanied by a document profile comprising information organized according to predefined fields relating to the document.

The web server includes a web server program. The web server also includes a web server helper application using the appropriate API such as, for example, the Common Gateway Interface (CGI) program, BGI, NSAPI or ISAPI.

According to the representative embodiment of the present invention, each user has a user computer, such as, for example, a personal computer with an Intel Pentium processor and a fast modem that the user can use to connect to the Internet. The user computer has one or more local storage devices. In the representative embodiment, the user computer executes Netscape's Navigator 2.1 browser program. However, other browser

programs, such the Mosaic browser or Microsoft's Internet Explorer 2.0 browser could also be used. As used herein, the browser programs executed by the user computer will be termed "Internet browsers."

5

When the user initially accesses the web server, the user is required to provide a user identification code ("ID") and a password. The web server submits a login request to the CGI program to verify that no other user is using
10 the same ID. According to the present invention, a user is permitted to access the web server from a different user computer or using a different Internet browser; however, the present invention prevents the user (or other users) from "concurrently" accessing the web server
15 from more than one computer or Internet browser using the same ID.

Once the user has provided the ID and password, the repository server will determine what information that
20 user is authorized to receive. According to the present invention, each user has authorization to access all or a subset of the information stored at the repository server.

25 In the representative embodiment, the repository server can provide the user with a list of new documents that have been recently received by the repository server and which that user is authorized to access. The user may also request a list of documents that fit certain user-
30 specified search criteria. A list of the documents that match that search criteria and which the user is authorized to access is provided to the user computer. The user can then select, request and view documents from these lists.

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Different users may be permitted to access different subsets of the documents stored at the central

repository.

According to the present invention, the web server is coupled to at least two database search engines in the repository server. At least one search engine performs at least full text searching of textual documents. At least one other search engine performs at least searching on predefined fields of information. When a search is submitted by the user to the web server, it is determined what type of search is required, and the appropriate query (e.g., full text, search on predefined fields) is formulated and submitted to the appropriate search engine. The search engine returns a results set to the web server. Typically, the results set will comprise a list of documents satisfying the query and that the user has authorization to access. This architecture ensures that the most efficient search engine is used to obtain the search results and allows more than one search to be conducted in parallel.

In the representative embodiment, the repository server includes a number of optimizers. An authorization optimizer builds the least expensive (in terms of execution time) search selection clause which will restrict the user's query to the database subset that the user is authorized to access. A sorted queries optimizer speedily provides users with the results set even when the number of elements in the results set is substantial. The web server sends a query block to repository server for optimization and the actual database query is built by a database server.

Communication delays over the Internet are used to make apparent response time at the web server faster by interleaving server access and response through an asynchronous protocol to the search engine.

The web server can provide customized views of the information provided to users. The web server has access to a number of different template forms. The template forms are written in a novel computer language, called
5 herein a "research access language" (or RAL) that describes how to format a HTML document and integrate the information from results set into this format. The web server interprets the template form and creates a HTML page comprising the information from the results set.
10 The web server may have a number of template forms, for each type of query, for each user or class of user, etc. Thus, each user or class of users may receive information in a format defined for that user or class of users. The template forms of the present invention provide an
15 additional advantage. Whenever the information provider wishes to change the output format of the information provided to users, a new template form is created and used by the web server. Template forms can easily be created (without having to "hardcode" any program) and
20 can be loaded for use without having to take the web server off-line.

The present invention is ideally suited for providing investment research reports to investors and investor
25 advisors. Brokerage and investment banking firms create mounds of investment research reports on a daily basis concerning thousands of companies and industries. These reports are provided to investors in electronic form. At present, these reports are distributed over proprietary
30 networks, requiring the installation and maintenance of expensive hardware, software and communication lines. Because of this expense, the number of users who have access to these proprietary networks is limited. In the representative embodiment, the present invention enables
35 investment research reports to be securely distributed to investors over the Internet. The present invention overcomes the disadvantages of Internet (e.g., slower

than proprietary networks, less secure, user interface limited to HTML format) and enables investment research reports to be distributed to a wider range of investors who are authorized to receive such reports.

5

Brief Description of the Drawings

Fig. 1 is a diagram of the overall system architecture of the present invention.

10

Fig. 2 is an example bulletin board screen display.

Fig. 3 is an example document query form screen display.

15 Fig. 4 is an example query results screen display.

Fig. 5 is a system architecture diagram of an enhanced system according to the present invention.

20 Detailed Description

For ease of description, the embodiment of the present invention described herein is that used for the electronic distribution of investment research reports and morning meeting notes ("reports") to investors via the Internet's World Wide Web ("WWW"). However, the invention is not so limited, and can be used, where appropriate, for the electronic distribution of other types of information via other types of networks.

30

Brokerage and investment banking firms spend large sums of money creating, printing and distributing thousands of graphic-rich research reports to investors (e.g., customer's, remote sales offices, investment advisors, brokers, portfolio managers, etc.) Brokerage and investment banking firms distribute their reports only to selected investors (e.g., their customers). However,

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each investor may receive reports from more than one brokerage or investment banking firm. Investors require access to these reports on a timely basis. It is also desirable to search all available reports for those reports that may be of interest to the investor. The representative embodiment of the present invention provides an advanced, secure system to distribute reports on a timely basis from brokerage and investment banking firms to investors and that allows investors to access and query a database of reports located at a remote location.

As used herein, the terms "investor" and "user" include any end user who is permitted to receive or access information via the present invention, such as, for example, customers of brokerage and investment banking firms, employees of brokerage and investment banking firms, investment advisors, brokers, bankers, portfolio and fund managers, journalists, analysts, economists, university professors, MBA students, etc.

Referring now to the drawings, and initially Fig. 1, there is illustrated an overall system architecture according to the present invention. A central repository server 2 is coupled, via a central site 1, to one or more remote contributor workstations 14, 16, 18. The contributor workstations 14, 16, 18 are used by brokerage and investment banking firms to submit reports to the repository server 2. Optionally, the contributor workstations 14, 16, 18 may be coupled to the repository server 2 via proprietary network comprising a plurality of contributor servers 20, 22. Alternatively or additionally, a contributor workstation may provide reports to the repository server 2 via the Internet.

In the representative embodiment, the contributor workstations execute a program called Multex

Contributor™, described in detail in the user manual titled "MX Contributor - User Guide" available from Multex Systems, Inc. of New York, New York and expressly incorporated herein by reference. The Multex
5 Contributor™ program is a real-time Windows-based document indexing and transfer program used to disseminate reports to the central site 1. The contributor simply completes a form (a document profile) displayed on the screen of the contributor workstation
10 14, 16, 18 and, at the specified time, the Multex Contributor™ program transfers the report, along with the information in the completed form, to the central site 1.

At the contributor workstation 14, 16, 18, the
15 contributor completes a form relating to the report. First, the contributor selects a report for distribution. The report is stored, usually as a file, in electronic form on the contributor workstation 14, 16, 18 or on a server or network drive coupled to the contributor
20 workstation 14, 16, 18. The report may be in any standard electronic format, for example, Pagemaker, Microsoft Word for Windows, Corel WordPerfect, etc. The form has fields relating to the report, for example, title, author, subject, date and time of creation,
25 distribution level (setting distribution to a default group of investors or one of a set of predefined groups of investors) and expiration time. Optionally, the contributor can enter additional information in the form, such as, for example, ticker symbol, industry group,
30 synopsis, country, region, currency, etc.

Once the report has been selected and the form completed, the user issues a "contribute" command to the Multex Contributor™ program and the report and all the
35 information in the form is electronically transmitted to the contributor server 20, 22. In the representative embodiment, the reports are "pushed up" from the

contributor servers 20, 22 to the central site 1.

- At the central site 1, the reports are processed.
- 5 Typically, the central site comprises a network of computer processors. At the central site 1, each report is converted in to a predetermined a predetermined format. In the representative embodiment, all reports received at the central site 1 are converted at the
- 10 central site 1 into a format that can be read by the Acrobat Exchange program, available from Adobe Systems. The reports are then provided by the central site 1 to the repository server 2.
- 15 Where desired, the repository server 2 can also receive, store and enable the distribution of other useful information, such as, for example, news reports received from wire services, government reports, product reviews, etc.
- 20
- The repository server 2 comprises or is coupled to at least two database servers 11, 13. Each database server is coupled to a database storage device 10, 12. A relational database 10, 11 allows field searching. In
- 25 the representative embodiment, the relational database 10, 11 is an SQL database server 11 coupled to a storage device 10. A full text database 12, 13 allows word or text searching. In the representative embodiment, the full text database 12, 13 is a full text search database
- 30 server 13 (for example, a full text search engine available from Fulcrum of Ottawa, Canada) coupled to a storage device 12.
- The information contained in the form is indexed in the
- 35 relational database 11 to allow retrieval of the report by searching on such fields, e.g., searches by author, date, industry, etc. Where necessary, information in the

form received from the contributor is mapped into "common" terminology as used by the relational database 11. For example, the terms "sports utilities" and "minivans" may be mapped and stored as the term "automobile." ASCII text is extracted from the report and stored in the full text database 12, 13 for full text searching.

The repository server 2 provides investors with lists of reports received from the contributor workstations 14, 16, 18 and allows investors to request lists of reports that fit certain criteria. The investor can select reports from these lists to down-load, view and/or print. Generally, lists of reports can be generated by the web server 4.

The contributor of a report can be notified that a particular investor has accessed that report. The repository server 2 maintains for each report a list of those who accessed that report. The repository server 2 can transmit that list to the report's contributor on a regular basis and/or when requested by the contributor.

The repository server 2 is coupled to a web server 4 which in turn is coupled to the Internet via, for example, a T1 or ISDN connection. The web server 4 is a high powered server computer that runs a web server program. In the representative embodiment, the web server 4 executes Netscape's Commerce Server program. The web server program allows web pages (in HTML format) to be accessed by investors. The web server 4 also executes other programs and subroutines as required.

Each investor has a user computer 6, 8, such as, for example, a personal computer with an Intel Pentium processor and a fast modem. In the representative embodiment, the user computer 6, 8 executes an Internet

browser program, such as, for example, Netscape's Navigator 2.1 browser program. The Internet browser can read files in HTML format. In the representative embodiment, the Internet browser has access to a plug-in
5 program that can read files in the predetermined format. In the representative embodiment, the plug-in is the Acrobat Exchange program, available from Adobe Systems that can read files in ".pdf" format. The user computer
6, 8 can connect with the Internet via, for example, a
10 commercial Internet Service Provider.

The web server 4 includes to a web server helper application, which in the representative embodiment is the CGI (common gateway interface) program, that is
15 activated by investors through web pages provided by the web server 4. CGI is an interface between the web server program and other programs. CGI lets those other programs process HTML forms and other data coming from Internet browsers, and then lets the other programs send
20 a response back the web server 4 to be delivered to the Internet browser. The response can be HTML files, GIF files, PDF files or any data that the Internet browser can view. Thus, generally, when an Internet browser requests a document from the web server 4, the web server
25 4 server program finds the document and sends it to the Internet browser. However, if the Internet browser requests a CGI program, the web server 4 server program acts as a middleman between the Internet browser and the CGI program. Other web server helper applications, such
30 as, for example, BGI, NSAPI or ISAPI, can be used in place of CGI within the principles of the present invention.

Access to the web server 4 begins from an investor's
35 Internet browser. Initially, the investor can access "public" web pages generally describing some of the features of the document delivery service of the present

invention. If the investor chooses to proceed, the investor selects the "log-in" option from the initial web page.

- 5 **User Verification:** The first step the web server 4 takes in handling an investor request is verifying that the investor is permitted to access the information stored at the repository server 2. This is accomplished using the standard verification procedure built into the
10 communication protocol between Internet browsers and web servers.

The web server 4 uses Netscape's Commerce Server's ability to call custom verification subroutines when a
15 user tries to access CGI's and web pages. The web server 4 executes a subroutine and, using Netscape's NSAPI, receives the ID and password that the investor is asked to provide by the server/browser, and then verifies the ID and password against a database of authorized users
20 (the user database) maintained at the repository server 2. If the user is verified, the Internet browser will be given a verification signature. An investor who is not in the user database, or enters an incorrect password, is denied access to CGI's and web pages on the web server 4
25 by simply having the subroutine return an "Access Denied" flag to the web server 4. This subroutine maintains an open connection to the user database to improve performance.

- 30 Whenever an investor makes a query for a list of reports, the investor's Internet browser sends an HTTP (hypertext transfer protocol) request that represents what the user wants to the web server 4. If the request does not have a verification signature attached to it, the web server 4
35 sends a command back to the Internet browser, causing it to prompt the user for an ID and password. The Internet browser will then return this information to the web

server 4, which will verify that the user is entitled to access the reports stored at the repository server 2. If the user is verified, the Internet browser will be given a verification signature. If not, the user will be
5 prompted again for his ID and password. Once access is verified, the web server 4 will start the CGI program named in the original HTTP request, along with any run-time parameters that are specified in the request. The CGI program first verifies that the user making the
10 request (whose ID is passed to the CGI program by the web server 4 through an environment variable) is the only one using that ID at that moment. This is done by the following method:

- 15 a. The CGI program gets the value of the Internet browser "cookie", and extracts the value for the named pair "mxauth" from the cookie.
- 20 b. If the value is empty, the CGI program indicates that this user is accessing the web server 4 for the first time since starting his or her Internet browser. This user then becomes the designated "current user of this ID". A new random value for the "mxauth" part of the browser cookie is generated, stored on the web server 4 under this user's ID, and sent
25 back to the Internet browser, so that the Internet browser can send it back next time.
- 30 c. If the value is not empty, the CGI program indicates that this user has previously already accessed the web server 4 since starting the browser program, and has been given an authorizing cookie. If the "mxauth" value of the cookie does not match the value stored on the web server for this user, then this user has been superseded by another user using the
35 same ID. The CGI does not perform the requested task, and tells the user that access is denied. If the "mxauth" value of the cookie

does match, then this user is authorized to continue, and the CGI performs the requested task. Each time the user is authorized to continue, the time of the access is stored on the web server 4.

- d. A stored cookie value that is over an hour old is considered "stale". A user whose code does not match a stale cookie is allowed access as if the user was initially signing on, as per b. above.

Part of the rationale for this method comes from the lack of a "sign-off" from a user. When a user "leaves" the web server 4 to browse other parts of the WWW, or closes down his or her Internet browser, the web server 4 is not informed.

(For reference, it is noted that cookies are a general mechanism which server side connections, such as CGI scripts, can use to both store and retrieve information on a client side of an Internet connection. A web server, when returning an HTTP object to an Internet browser, may also send a piece of state information which the Internet browser will store. Included in the state object is a description of the range of URLs for which that state is valid. Future HTTP requests made by the Internet browser which fall within that range will include a transmittal of the current value of the state object from the Internet browser to the web server. For no compelling reason, the state object is known in the art as a "cookie.")

Other systems that allow only one instance of an ID to be active at one time rely on a "sign-off" notification to tell when the ID can be used again for "sign-on". Because the web server 4 does not receive a "sign-off", it is assumed that any new user is allowed to "sign-on"

with that ID, but all others that are currently using that ID will now be denied further access, until they "sign-on" again (which involves closing down the browser, then restarting it again). Furthermore, step d. is included to keep a user from locking himself out of his own ID if he happens to use browsers from two different locations, such as home and office.

Thus, the following scenarios apply:

10 *Scenario 1:*

- * User 1 signs on to the web server 4 at his office. The CGI marks this browser/user ID combination as the current user.
- * At 5:00PM, he goes home, without closing down his browser.
- * At 5:45PM he signs on from his home computer. The CGI now marks this browser/user ID as the current user.
- * At 10:00PM, he goes to bed, without turning off his browser.
- * At 8:00AM the next day, he arrives at work, and tries to access the web server 4 again. Because his 10:00PM cookie is now "stale", the CGI marks the office browser/user ID as the current user.

Scenario 2:

- * User 1 signs on to the web server 4 at her office. The CGI marks this browser/user ID combination as the current user.
- * She then goes to the desk of User 2, and shows User 2 "this new web service", using her own user ID and password to sign on to the web server 4. The CGI marks User 2's browser as the current user of User 1's ID.
- * After a few minutes, User 1 returns to her original computer, to find that the CGI is

20

denying her access. User 2 has her locked out by using her ID.

5 This user verification system is particularly well suited in information delivery systems where a fee is charged per ID/password.

Web Server: The web server 4 uses a single CGI program that handles all the types of requests that a user makes
10 to the web server 4. In the representative embodiment, the types of requests that the CGI program can handle are:

- * Return a list of reports recently received at the repository server 2.
- 15 * Reformat the current list of reports.
- * Present a form that allows the user to specify criteria for reports the user wants to access.
- * Return a list of reports matching the criteria in the form mentioned above.
- 20 * Return a list of reports summarized by report contributor.
- * Return a list of reports authored by a specific contributor.

These requests are handled similarly, except for the
25 request for the form that the user fills in to specify criteria for reports that the user wants to access.

Except for the third request listed above, a query is formulated (whose parameters are determined by the run-
30 time arguments given to the CGI from the original HTTP request from the investor) by the web server 4 and sent to the appropriate database 11, 13. A result set (a list of reports) is returned and stored in memory. The CGI then opens a HTML template form that comprises RAL
35 (research access language) elements, fills in each RAL element with data from the result set and sends the contents of the template to the Internet browser through

the Web Server 4. (In the case of the reports that are summarized by contributor, the CGI simply condenses the list of headlines internally to summary form, before using the template.) When the output from the CGI is
5 received at the investor's Internet browser, the browser forms it into a "page" of information, along with action buttons that the investor can select to initiate other requests.

10 The request to present a "report query form" (the third request listed above) calls for the CGI to make two queries from the relational database 11. The first query is for a list of all contributors whose reports this investor has authorization to access. The result set of
15 this query is used to fill a list box, from which the investor is expected to pick the particular contributors whose reports the investor would like to access. The second query is for a list of all industries. The result set of this query is used to fill a list box, from which
20 the investor is expected to pick the particular industries that the investor is interested in. These list boxes are defined in the HTML template with RAL elements that are appropriate to this particular user request.

25 When a query is made, the web server 2 selects the appropriate database to which the query is first routed. In summary, if the query involves text matching (e.g., a full text search) within reports, the query is passed to
30 the full text database 13. If the query does not involve text matching within reports, the query is passed to the relational database 11.

In the representative embodiment, each database comprises
35 a number of database servers networked together. (for example, database server 13 comprises a network of database servers.) The database servers that are

available to the CGI are listed in the WEBPUBL.INI file on the web server 4. When satisfying a non-text matching query, the CGI will attempt to use an SQL type server (e.g., 11) first. If that database server is not
5 available, the CGI will automatically switch to the next available SQL database server. (If all SQL database servers are not available, then the query will be passed on to full text database server (e.g. 13).) When satisfying a text matching query, the CGI will attempt to
10 use an full text database server (e.g. 13). Again, if that server is not available, then its backup will be tried, and so on, until either a server can satisfy the query, or all servers have been found to be down. In addition to this automatic backup system, the CGI
15 practices semi-random selection of servers in an effort to balance the load on the servers. This means that the order that servers are tried is not always the same.

The HTML template forms that the CGI uses rely on forms
20 that are part of HTML. This allows the users to select buttons on the pages to submit requests. Each page may have several buttons, and the names of the buttons (the actual visible text in them) are used in the CGI to identify which button the user selected, and therefore,
25 which action to perform. Parameters for a query are taken from other form constructs, such as text fields, list boxes, and combo boxes. When a form does not actively show a parameter value, but it would be convenient for the CGI to maintain its value for the next
30 user request, the values are stored as "hidden" fields in the form. (A hidden field is a form construct defined in HTML for just this purpose.) This allows the parameters of a query to be stored in a page that shows the results of a query, so that they can then be used again as
35 starting values when the user requests the report query form.

Authorization: In the representative embodiment, each user has authorization to access a subset of the information stored at the repository server 2. The contributor determines who has access to each report.

5 For example, an investment bank may designate that one of its reports can be accessed only by its employees and certain investors (e.g., its customers). Another report may be designated as accessible by employees only. A third report may be released for general distribution to

10 all who wish to access that report.

Every document contributed by a contributor is identified by a "contributor ID". Furthermore the document is assigned by the contributor to one or many "document

15 groups" owned by the contributor. (Documents usually belong to one document group.)

The authorization information links an investor to a list of document groups. Each investor may be permitted to

20 access documents in one, some or all document groups.

The repository server 2 constantly maintains an up to date list of all the report groups available along with the reports in the relational database 11. This list is

25 updated in real time after a report is added, and completely refreshed daily (e.g., after report removal of expired reports).

To submit a query, an investor must be identified by the repository server 2. As the investor's credential are

30 checked (see above), the authorization information is retrieved by the repository server 2. This authorization information contains a list of report groups the investor is permitted to access.

35

Optimizations: Two types of optimizations are performed by repository server 2. The first is a simplification of

the authorization restriction. The second is an optional optimization performed when the result set has to be sorted; it is aimed at reducing the perceived response time for the first answers to a query.

5

One of the characteristics of the architecture of the present invention is that each query submitted to a database 11, 13 is submitted as a structure description, rather than a fully formed SQL statement. The actual SQL
10 statement is built by the database server 11, 13 itself. Thus, the optimizations can take place on the raw query definition (i.e., a structure definition) before executing the query. This allows for more powerful query optimization, and immediate query definition analysis to
15 select the proper mechanism to execute it.

1. Optimization of the authorization restriction

In query definition, the investor can restrict the query to a subset of the contributors the investor has access
20 to. This feature is used to implement queries like "What's new today from XYZ" and "All reports relating to automobiles from PQR."

The purpose of the authorization optimizer is to build
25 the least expensive (with respect to execution time) selection clause, which will restrict the investor's query to the database subset the investor is allowed to access.

30 The authorization optimizer uses this database content information, combined with the investor's accessible groups, as well as the contributor restriction in the query, to build the restriction clause using the following method.

35

The repository server 2 builds two lists of groups:
a) the list of groups the investor has requested and

25

has access to.

- b) the list of groups the investor has requested but doesn't have access to

5 Based on the number of elements in these two lists the authorization optimizer will build the proper restriction clause.

10 The following pseudo code describes the actual code used to implement this algorithm:

```

    for (all the groups in the investor's allowed group list) do
    begin
        if (group is in the query contributor restriction)
        15         and group is in database)
            then add group to the allowed list
        end

    for (all the groups in the database) do
    20     begin
        if (group is in the query's contributor restriction)
            and group is not in the investor's allowed list)
            then add group to the disallowed list
        end

    25     if (allowed groups list is empty)
        then deny request
    else if (disallowed groups list is empty)
        then no restriction
    30     else if (decisionFunction (allowed list, disallowed list))
        then restrict to groups in allowed list
        else restrict to groups not in disallowed list

```

35 The "decisionFunction" selects the shorter of the two lists, namely, allowed list and disallowed list.

This optimization is more efficient when the database's content is close from the investor authorization, since
 40 it works by trimming the unnecessary restrictions for groups without reports in the database.

To improve the efficiency of this optimization when the

number of groups in the database grows, the records could be dispatched to different tables based on groups and the same optimization algorithm could be used to select the appropriate table and generate a different restriction
5 clause for every table targeted.

2. Optimization of sorted queries

The purpose of the sorted queries optimizer is to provide the investor with a fast answer even when the number of
10 elements to sort is substantial.

Unlike other applications used in memory sorting, database sorting can rely on a buffer being swapped in and out to disk from the main memory. When the number of
15 items to sort becomes significant, these I/O operation can consume a lot of time. When an investor submits a query via the Internet, the repository server 2 via the web server 4 returns the first hundred rows by default, the most recent reports being displayed first. The
20 actual query result may contain thousand of reports. Thus, to display the hundred most recent reports, the database has to sort the whole result set before returning any answer.

25 In order to provide the investor with a quick answer, the sorted queries optimizer will try to run multiple queries, each for a smaller subset of the query. If the query has to be sorted by the report's date, the sorted queries optimizer divides the requested time period of
30 the query definition into multiple chunks and executes the same query restricted to every chunk. Accordingly, the sorted queries optimizer does not disturb the sorting order.

35 Based upon tests of real data sets, it was found that it was more efficient to perform only two queries, rather than a lot of them. The first query is performed on the

first 10th of the time period, the second one on the remainder period. For some typical queries, the second subquery execution is unnecessary since the first query had already returned the number of rows requested by the investor.

For database 13, the retrieving of a count is orders of magnitude faster than retrieving the full result set. The present invention takes advantage of this characteristic to give an immediate feedback to the investor. As soon as a query is submitted, the present invention performs a count and sends this information to the web server 4. The web server 4 can take advantage of this feature to return that information to the Internet browser by flushing it's internal buffers. That way, even when the retrieval of the result set takes tens of seconds, the investor gets some feedback in seconds.

Ideally, the sorted queries optimizer is used only for sorted queries and when the number of rows is above a given threshold. The present invention uses the result of the count to trigger the sorted query optimization.

The following pseudo code describes the code used to implement the sorted queries optimizer:

```

Retrieve the count
if (Query is sorted by a time) and (count >= threshold) then
  begin
    if (query definition contains a time range)
      then get the time range from the query definition
      else use an appropriate default value

    add the restriction for 1/10th of the time range
    retrieve the first rows
    rows_still_to_fetch = rows_requested - rows_already_fetched

    if (rows_still_to_fetch > 0)
      begin
        add the restriction for remainder of the time range

```

```
                retrieve rows_still_to_fetch rows  
            end  
        end
```

- 5 This optimization significantly improves the response time when the time to perform the additional query is negligible compared to the time necessary to sort the full set.
- 10 The communication delay inherent in the connection between the Internet browser and the web server 4 may also introduce additional delays hiding some of the optimization benefits.
- 15 **Templates:** According to the present invention, the web server 4 executes a research access program. The research access program provides a mechanism that enables an investor to access the information in the databases 11, 13. The research access program also implements an
- 20 Internet CGI, which accepts input parameters from HTML forms, and then using templates forms, generates HTML pages comprising information retrieved from the databases 11, 13. The template forms are written in a novel computer language, called herein a "research access
- 25 language" (or RAL) that describes how to integrate the information retrieved from the databases 11, 13 into this form. The template forms include RAL elements, as discussed in detail below.
- 30 The present invention allows investors to submit queries and receive in response thereto a list of reports that satisfy the queries. The queries are constructed from one or more search parameters, including: which contributing company published the report; which stock
- 35 symbols figure prominently in the report; when the report was published; what industries are featured in the report; and keyword search parameters.

An investor may enter search parameters at a user computer 6, 8 via a web page provided by the web server 4. When the investor selects the "submit" button on the web page, the search parameters are forwarded by the Internet browser to the web server 4. The search parameters are used to form a query. The query is submitted to the appropriate database 11, 13 and a list of matching documents is generated. This list is formatted on the web server 4 into HTML form, and sent to the investor at the user computer 6, 8, where the investor's Internet browser displays the list to the investor.

The input to the research access program of the present invention comes from HTML forms completed by investors. The fields that can be searched on for document queries (and the expected values of such fields) include:

date: A date range from "today" backwards, matching a document's official release date. Possible values include:

0	Today
1	Last 2 Days
2	ThisWeek
3	Last 7 Days
5	Last 14 Days
7	This Month
8	Last 30 Days
10	All Dates
12	Last 60 Days
13	Last 90 Days

ticker: A field for ticker symbols.

query: A field for "free text" for searches of the document text. Logical expressions can be used, including the ampersand ('&') for a logical 'and', and the pipe character ('|') for a logical 'or'. Parenthesis can be used for grouping expressions, and double quotes can be used to group words into phrases. All free text searches are not case sensitive.

For example:

30

- | | | |
|----|-----------------------------------|---|
| | microsoft | Find documents with 'microsoft' in their text. |
| 5 | ibm & microsoft | Find documents with 'ibm' and 'microsoft' in their text. |
| | ibm microsoft | Find documents with either 'ibm' or 'microsoft' in their text. |
| 10 | ibm &
(microsoft
 apple) | Find documents with 'ibm', and either 'microsoft' or 'apple' in their text. |
| 15 | "earnings report" | Find documents with the phrase 'earnings report' in their text. |

- contributors: A field for a comma separated list of contributor ID's.
- industries: A field for a comma separated list of industry ID's.

- There are a number of options for displaying information to an investor. Some of these options are based on technical limitations (such as line speed), while others are based on the preferences of the investor (e.g., tabular output, prose, etc.). In order to react quickly to changes in display requirements, the research access program of the present invention utilizes template forms to format HTML pages comprising search results.
- According to the present invention, information retrieved from the databases 11, 13 is placed in HTML page format according to changeable template forms for said HTML pages.
- Thus, input (included in the HTML forms completed by investor) to the research access program of the present invention from an investor can include view mode parameters relating to the format in which the investor wishes to receive the search results and other information. By supplying view mode parameters, the investor can indicate to the web server 4 the desired format of information, including how many records of information are displayed. View mode parameters (and

expected values) include:

FT: Form Type. Expected values are 'L' for 'list format', 'T' for 'table format', and 'D' for double line format.

5 **viewmode:** This field indicates whether all records that are returned by a query should be displayed (within reason -- in the representative embodiment, there is a display limit of 1000 records), or whether the number of records display should be limited to a predetermined
10 number. If the 'viewmode' value is set to 'all', then all records will be displayed. Otherwise, the number of records displayed will be limited to the predetermined number.

15 To submit a query, the user completes the fields discussed above and then selects a "submit" button. When an investor submits a query, the name and value of the HTML form 'submit' button selected are treated as input. In the representative embodiment, if the following
20 strings appear in the 'name' of the submit button, they are treated in the following manner:

submit: Make a query according to the parameters listed above.

bboard: Same as submit, except that the query
25 formulated includes the requirement that only documents recently received at the repository server 2, e.g. since midnight, be returned.

long: Change the view mode to a double line format.

short: Change the view mode to a list format.

30 **table:** Change the view mode to a table format.

summary: Same as submit, but also requests generation of a summary list, breaking down the number of documents that match the query by submitting contributor, and the document type (research document, or morning call note).

35 In addition, generates stored HTML files for each contributor in the summary, with one listing of the individual research documents, and another for the

individual morning call notes. In the summary list, generates links to the stored HTML files.

notes: Same as summary.

all: Change the view mode to view all documents.

5 last: Change the view mode to view the 100 most recent documents.

query: Generate a query form for the user.

count only: Display the number of documents that match the query that matches the current parameters.

10 company search: Generate a list of companies (named symbols), and place the list in a form from which the user can choose a company to perform a search upon.

choose symbol: Generate a query form for the user, pre-setting the ticker input item to the value selected from
15 a symbol list.

The program output, of course, depends upon the input including which 'submit' button was selected by the user. The user's choice of a submit button determines which
20 template will be chosen for output.

Additionally, templates may be preset for a user or a group of users. Thus, all users from a particular company or geographic area may be assigned one group of
25 templates and all users from another company or geographic area may be assigned another group of templates.

Once a template file is opened, the characters in it are
30 passed directly through to standard output (the normal CGI output channel), until an RAL element is encountered. In that case, the RAL element is processed according to the rules set forth below, and the output from the RAL element is also sent to standard output, inserted into
35 the stream of characters in the template.

The following are examples of templates that may be used:

	resultrl.tpl:	List form output for a query.
	resultrd.tpl:	Double line output for a query.
	resultrt.tpl:	Table form output for a query.
5	resultcl.tpl	List form output for a query, broken down by contributor and document type during a summary.
	resultcd.tpl	Double line output for a query, broken down by contributor and document type during a summary.
10	resultct.tpl	Table form output for a query, broken down by contributor and document type during a summary.
	resultq.tpl	Query form.
	resultx.tpl	Query count.
15	resulti.tpl	Symbol Guide form.
	resultt.tpl	Standard HTTP header prepended to each of these templates.
	bboardrl.tpl:	List form output for a bulletin board.
	bboardrd.tpl:	Double line output for a bulletin board.
20	bboardrt.tpl:	Table form output for a bulletin board.
	bboardcl.tpl	List form output for a bulletin board, broken down by contributor and document type during a summary.
	bboardcd.tpl	Double line output for a bulletin board, broken down by contributor and document type during a summary.
25	bboardct.tpl	Table form output for a bulletin board, broken down by contributor and document type during a summary.

30

If a query is submitted with no parameters filled in, the query is termed a bulletin board query and requests the most recently available documents on all subjects.

35 Research Access Language

The following is a description of the RAL of the present invention. RAL elements begin with a start token, finish

with an end token, and contain attributes in between.
 The start token is followed by a "white space" character.
 Attributes are indicated by the name of the attribute,
 followed by an equals sign ("="), followed by the value
 5 of the attribute. An attribute name consists of
 consecutive alphabetic characters. An attribute value
 consists of consecutive non-white space characters,
 unless it is enclosed by double quotes, in which case it
 consists of all characters enclosed in a pair of double
 10 quotes. An end token contained within a non-quoted
 attribute value will truncate the attribute value, and
 the language element. The following is a syntax
 description of an RAL element:

```

15 start-token      := "{mx" <white-space>
   white-space     := (any ASCII character value between 1 and 32, inclusive)
   end-token       := "}"
   attribute       := <attribute-name> "=" <attribute-value>
   attribute-name  := "end" | "name" | "true" | "width" | "align" | "start" | "false" | "empty"
20               | "match" | "format" | "select" | "quotes"
   attribute-value := <double-quotes> <any-characters> <double-quotes> | <any-non-
                       white-characters (except end-token)>

```

Examples:

```

25     {mx name=headline align=left width=50}
       {mx start=documents}
       {mx name=synopsis match=1 true=Yes false="" }

```

30 Attribute Names

align

The 'align' attribute specifies the alignment of the
 output from the current element, within the width
 35 indicated by the 'width' attribute in the element.

Possible values:

```

    left  (default)
    center
    right

```

40 See also:
 width

empty

The 'empty' attribute specifies what should be displayed as output for the current element, if the evaluated output for the element (before padding or alignment) is an empty string. This attribute is different from others, in that it remains in effect for all following language elements, until its value is changed.

Possible values:

(Any string. Use "" to indicate an empty string.)

10

end

The 'end' attribute marks the end of a loop. The attribute value indicates which type of loop the current element marks the end of.

15 Possible values:

document
contributorlist
industrylist
symbollist

20 See also:

start

false

The 'false' attribute specifies a string value to be displayed as output for the current element if the evaluated value for the 'name' attribute does NOT match the value of the 'match' attribute. This string may also use the '%s' feature described under 'format'.

Possible values:

30 (Any string. Use "" to indicate an empty string.)

See also:

match, true, format

format

35 The 'format' attribute specifies simple output formatting for output of the current element. Its format is the same as a C language printf() format string, but allows

only string formatting (%s), and only one occurrence of that within the format string. The evaluated value of the element, as a string, is used as the value to fill the '%s' in the formatting string. Some examples are:

5

Format string	Element Value	Output Result
"%s"	"ABC Corp."	"ABC Corp."
"%15s"	"ABC Corp."	"ABC Corp. "
"%-15s"	"ABC Corp."	" ABC Corp."
"%5.5s"	"ABC Corp."	"ABC C"
"%s Documents"	"ABC Corp."	"ABC Corp. Documents"

10

Possible values:

(Any valid C printf() formatting string.)

15 See also:

align, width

match

The 'match' attribute specifies a value which the RAL processor will compare to the evaluated result from the 'name' attribute. If the two values match exactly, then the output from the current element will be the string specified by the 'true' attribute, otherwise the output will be the string specified by the 'false' attribute.

25 Some examples are:

Match	True	False	Element Value	Output
"1"	"Synopsis"	" "	"0"	" "
"1"	"Synopsis"	" "	"1"	"Synopsis"

30

Possible values:

(Any valid string. Use "" for an empty string.)

See Also:

true, false, name

35

name

The 'name' attribute specifies a data field to be used as

the output for the current element. The data field name given as the value for this attribute is the name of a field in a research document description, a contributor description, an industry description, or a stock symbol description. A list of data fields supported is given in the "Data Fields" sections below. The field name can also specify any CGI input field (for CGI programs using RAL) by prepending an underscore character to the input field name, or it can specify any .INI file entry or environment variable by prepending a dollar sign to the entry/variable name.

Possible values:

(Any valid data field name, or _cgi-input-name, or \$ini-entry-name, or \$environment-variable-name.)

See also:

match, Data Fields

quotes

The 'quotes' attribute indicates whether output from the current element should be surrounded by double quotes. If this attribute is set to "1", the 'width' and 'align' attributes are ignored.

Possible values:

"1" to surround output by quotes

"0" to not surround output by quotes (default)

start

The 'start' attribute indicates the beginning point of a loop, with each iteration of the loop enumerating the data items specified by the value of this attribute. See the section "Data Enumeration" below for details.

Possible values:

documents

contributorlist

industrylist

symbolist

See also:

end, Data Enumeration

true

5 The 'true' attribute specifies a string value to be displayed as output for the current element if the evaluated value for the 'name' attribute matches the value of the 'match' attribute. This string may also use the '%s' feature described under 'format'.

Possible values:

10 (Any string. Use "" to indicate an empty string.)

See also:

match, false, format

width

15 The 'width' attribute specifies a number which gives the desired width, in characters, of the output for the current element. If the currently evaluated output is shorter than the 'width' value, then the output is padded with spaces on the left, right, or both, according to the value of the 'align' attribute. If the output is longer
20 than the 'width' attribute, the output is truncated on the right, and the last three characters are replaced with periods ('...') to indicate a truncated value.

Possible values:

25 (Any valid integer.)

See also:

align

Data Enumeration

30 The RAL attributes 'start' and 'end' are used to mark elements that are to be repeated during the enumeration of data objects. For example,

```
{mx start=documents}{mx name=headline}  
{mx end=documents}
```

35 would cause RAL to enumerate all documents that match the current query, outputting the headline of each one. (By placing the 'end' element on the next line, it also

causes the headlines to be separated by an end-of-line character). The available enumerations are listed below. All enumerations are filtered so as only to include documents the user that is making the enumeration is
 5 authorized to access. That is, not all users see the same results when making enumerations, according to their level of authorization.

documents

10 The 'documents' enumeration loops through the result set of a query on the database of research documents. In the current implementation, the input parameters to the query are taken from CGI input items from an HTML page. They are:

15 **daterange:** An integer from 0 to 12 specifying a date range for the release date of a document. The possible values are:

	0	Today
	1	Last 2 Days
20	2	ThisWeek
	3	Last 7 Days
	5	Last 14 Days
	7	This Month
	8	Last 30 Days
25	10	All Dates
	12	Last 60 Days
	13	Last 90 Days

ticker: A field for ticker symbols.

30 **query:** A field for "free text" for searches of the document text. Logical expressions can be used.

contributors: A list of contributor ID numbers which identify the contributors.

industries: A list of industry ID numbers relating to the document.

35

The following fields are available within a 'documents' enumeration, listed with the data they output:

	Analysts	Names of the analysts that compiled the document.
40	AnalystIDs	Numeric ID's of the analysts that compiled the document.

40

- ByteCount** Size of the document (in PDF form) in kilobytes or megabytes.
- Contributor** Name of the company that compiled the document.
- ContributorID** Numeric ID of the company that compiled the document.
- DocID** The internal system document ID number.
- 5 **DocType** 'R' for a research document; 'M' for a morning call note; 'N' for a news document.
- Headline** The headline of the document. The system of the representative embodiment also surrounds the output from a element that displays this field with an HTML "anchor" to a CGI that downloads the PDF file for the document, or
- 10 generates an HTML page for documents with no PDF form.
- PageCount** The number of pages in the document.
- ReleaseDate** The official release date of the document.
- Relevance** A number from 0 to 1000 that indicates the relevance of the document to the free text that was used in the query. The higher the number, the more
- 15 matches on the free text.
- SubmitDate** The date the document was submitted by the contributing company to the repository server 2.
- Symbols** A list of ticker symbols that the contributor listed as relevant in the document.
- Synopsis** A "1"/"0" flag that indicates whether a synopsis is available for the document.
- 20 By default, the value "Yes" is output if the synopsis is available, and "" is output otherwise. The representative embodiment also surrounds the output from a element that displays this field with an HTML "anchor" to a CGI that creates an HTML page with the actual synopsis text.
- 25 The following fields are available outside a 'documents' enumeration, since they are summary information or status information. Their values depend on the same query used within a 'documents' enumeration:
- ChangeViewMode**
- 30 Generates text that can be used within a button to change the mode used to display documents. When the current view mode is set to show all documents, this data field generates "View Last ###", where ### is equivalent to the "Maximum" data field. When the current view mode
- 35 is not set to show all documents, this data field

generates "View All ###", where ### is equivalent to the "Total" data field. This text can be used as the value of a 'submit' button in HTML, and a CGI can perform the appropriate action to change display modes.

5 **ContributorFilter**

Displays the name of the current contributor being used to filter documents.

ContributorsText

Displays the names of all contributors whose codes appear in the `_contributors` field.

Count

Displays the total number of documents actually retrieved by a query, as opposed the number of documents that actually match the query. When the view mode is set to show all documents, this field is equivalent to the "Total" data field. Otherwise, it is equivalent to the "Maximum" data field.

CountFilter

Displays the number of documents that match the current document type and contributor filter.

DocsShown

Generates variable text, depending on the view mode (all documents, or the limited (100) set). If the view mode is set to return all documents, this data field generates the text "### Entries", where ### is equivalent to the "Count" data field. If the view mode is not set to view all entries, the data field generates the text "Last ### of *** Entries", where ### is again equivalent to the "Count" data field, and *** is equivalent to the "Total" data field.

DocTypeFilter

Generates the text "Research", "Morning Call Notes", or "News", depending on the current value of the document type filter.

35 **IndustriesText**

Displays the names of all industries whose codes appear in the `_industries` field.

Maximum

This data field is the limit on the number of documents to be retrieved when the view mode is not set to show all documents. In the representative embodiment, this value is 100 by default, or the value specified in the "MaxRows" entry in WEBPUBL.INI.

MaxRows

If the view mode is set to show all documents, this data field is equivalent to the "Total" field. Otherwise, it is equivalent to the "Maximum" field.

MorningNotes

This data field is the number of morning call notes attributed to the current contributor specified in the contributor filter.

News

This data field is the number of news stories attributed to the current contributor specified in the contributor filter.

Research

This data field is the number of research documents attributed to the current contributor specified in the contributor filter.

Total

This data field is the total number of documents that match the current query parameters, regardless of view mode, contributor filter, or document type filter.

ViewMode

This data field generates "all" if the current view mode is set to view all documents that match a query. This field generates "last" if the current view mode is set to view only the last N documents that match a query, where N is equivalent to the "Maximum" data field.

contributors

The 'contributors' enumerations is the same as a 'documents' enumeration, except that the documents are grouped by their contributors. The only fields that can

be displayed are the contributor names, and the number of documents in the research and morning notes categories. This enumeration is used primarily for presenting document summaries by contributor to the users.

5

The following fields are available within a 'documents' enumeration, listed with the data they output:

Contributor

Names of the contributor in a group.

10 **MorningNotes**

The number of morning notes submitted by the contributor.

Research

15

The number of research documents submitted by the contributor.

contributorlist

20

The 'contributorlist' enumeration loops through the list of contributors from whom documents are available. This list is not based upon any query parameters -- if a user is entitled to see the documents of a particular contributor, the contributor's name is returned in the result set.

25

The following data fields are available within a 'contributorlist' enumeration:

ContributorID

An integer that identifies a contributor uniquely.

ContributorName, or Contributor

30

The name of the contributor.

The following data fields are available after a 'contributorlist' enumeration.

ContributorCount

35

The total number of contributors in the 'contributorlist' enumeration.

industrylist

The 'industrylist' enumeration loops through the list of industries about which documents may be compiled. There are no query parameters for the industry list. The following data fields are available within a

5 'industrylist' enumeration.

IndustryID

An integer that identifies an industry uniquely.

IndustryName

The name of the industry.

10

symbollist

The 'symbol' list' enumeration loops through all ticker symbols/company names that match a given input string. In the representative embodiment, the input string is
15 taken from the CGI input item named 'company'. If a company name contains the input string, the ticker symbol/company name is included in the result set for enumeration.

20 The following data fields are available within a 'symbollist' enumeration.

SymbolID

The stock ticker symbol recognized for a company on the stock market exchange where it trades.

25 **SymbolName**

The name of the company.

Program Control

RAL allows logical control over its output. The -if,
30 -endif, and -defer allow a template to make decisions about output based on run time values of CGI input variables, environment or .INI variables, and the values of data fields from enumerations. If a -if element evaluates to FALSE, then all text and elements between
35 the starting -if element and its terminating -endif element will not be passed through to output. If a -defer element is used inside a regular RAL element, then

the rest of the element is not evaluated, and is simply passed through to output, without the -defer element. This allows a template to evaluate some RAL elements, and leave others to be evaluated later, if the output is used
 5 as a template itself.

-if and -endif Usage

```
{mx -if <expression> }
...
10 {mx -endif}
```

where

```
expression := <value> <operator> <value>
value       := <string> | <number> | <variable>
15 operator := == | < | > | != | <= | >=
string      := <double-quote> [<any-characters>]+ <double-quote>
number      := <digit>*
variable    := [_ | $ ]<alphanumeric character> [<alphanumeric characters>]+
```

20 Only one expression is allowed. A variable that does not evaluate to a known value will be treated as if it were a string. If a variable is preceded by an underscore ("_"), its value is taken from a CGI input variable with that name, minus the underscore. If a variable is
 25 preceded by a dollar sign ("\$"), its value is taken from the environment variable or from the program's .INI entry which matches the variable name, minus the dollar sign.

The following example shows how the -if element can be
 30 used to display some text and values only if there are actually some morning notes in the result of the query.

```
{mx -if morningnotes != 0}
There are {mx name=morningnotes} -- Click the "AM Notes" button to access
35 them.<BR>
{mx -endif}
```

The following example shows how a CGI input variable can influence the output. In this example, if the "contributors" CGI form variable is not empty, then some text will be output, along with a built-in field that displays the names of all the contributors whose ID codes are in the "contributors" CGI form variable.

```

    {mx -if _contributors != ""}
    Query on contributors {mx name=contributorstext}
10    {mx -endif}

```

-defer Usage

The -defer element is simply a modifier for other elements. It keeps the RAL from evaluating an element immediately, and outputs the element as if it were plain text, except it leaves the -defer out. For example:

```

<option value=100 {mx -defer name=_contributors match=100 true=selected} > Selection Item 100

```

20 will output

```

<option value=100 {mx name=_contributors match=100 true=selected} > Selection Item 100

```

the first time it is processed, and will this if that output is processed:

```

<option value=100 selected> Selection Item 100

```

(This may leave the "selected" out, depending on the value of _contributors.)

One can have as many -defers as desired in an element -- they do accumulate. That is, having three -defers in an element will cause it to defer evaluation until the fourth processing.

An Example Use of RAL

The following is an example of RAL used within an HTML

file. A web CGI program that processes RAL can use this example file as a template, and fill in the RAL elements with the derived values of a query. This HTML has been simplified for the purpose of explanation, with comments
 5 in italics.

```

    <HTML>

    <HEAD>
  10  <TITLE>
      Bulletin Board
    </TITLE>
    </HEAD>

  15  <BODY>
      <h2> <i> Bulletin Board </h2> </i>

      <form method="POST" action="/CGIBIN/result.exe">
      <input type="submit" name="subaction" value="Refresh">
  20  <input type="submit" name="subaction" value="Query">
      <input type="submit" name="subaction" value="Summary">
      <input type="submit" name="subaction" value="AM Notes">

      Compare the total matching records to the maximum allowed in the display. If there are
  25 more, show the "change viewing mode" button.
      {mx -if total > maximum}
        <input type="submit" name="subaction" value="{mx name=changeviewmode}">
      {mx -endif}
      <input type="submit" name="subaction" value="Long Form">
  30 <input type="hidden" name="current" value="bboard"> <br>

      Display the total number of documents that matched, and how many will be displayed in this
list.
      <b> {mx name=docsshown} </b> <br>
  35 </form>
      <PRE>
      <B> Submit Company          Pgs Size Symbol   Syn Headline
        </B>
      <HR>
  40

      This part is a document enumeration. The enumeration shows the fields named
'updatedate', 'contributor', 'pagecount', 'bytecount', 'symbols', 'synopsis', and 'headline'.

```

Around the 'synopsis' field, there is a use of the -if element, which decides whether to output a hypertext links to the synopsis. There is no -if element for the , because an extra one doesn't hurt most browsers.

(The following lines are split up with newlines to make it easier to read -- running this HTML, it will not give the desired results.)

```

5  {mx start=documents}
   {mx name=updatedate width=7}
   {mx name=contributor width=20}
   {mx name=pagecount width=3 align=right}
10 {mx name=bytecount width=4 align=right}
   {mx name=symbols width=10}
   {mx -if synopsis == 1}
     < A HREF="result.exe?subaction={mx name=synfile}" >
     {mx -endif}
15 {mx name=synopsis width=3} </A>
   < A HREF="result.exe?subaction={mx name=docfile}" > {mx name=headline} </A>
   {mx end=documents} </PRE>
   <b>

```

```

20 Display the final counts.
   {mx name=research} Research Documents <br>
   {mx name=morningnotes} Morning Notes
   {mx -if morningnotes > 0}
   -- Click the "AM Notes" button to access them.
25 {mx -endif}
   <br>
   </b>

```

If there were more than a screenful of headlines displayed, create another form and display the control buttons again, just for the user's convenience.

```

30 {mx -if research > 17}
   <hr>
   <form method="POST" action="/CGIBIN/result.exe">
   <input type="submit" name="subaction" value="Refresh">
35 <input type="submit" name="subaction" value="Query">
   <input type="submit" name="subaction" value="Summary">
   <input type="submit" name="subaction" value="AM Notes">
   {mx -if total > maximum}
     <input type="submit" name="subaction" value="{mx name=changeviewmode}" >
40 {mx -endif}
   <input type="submit" name="subaction" value="Long Form">
   <input type="hidden" name="current" value="bboard">
   </form>

```

```
{mx -endif}  
</BODY>  
</HTML>
```

It will be appreciated that the templates and research
5 access program described above are of general
application, and can easily be modified to be used in
many applications and fields. Accordingly, the templates
and research access language should be understood as
applicable to applications and fields other than for the
10 distribution of research reports.

Step-by-Step Examples

The following are three step-by-step examples
illustrating some of the principles discussed above. The
15 first example describes what happens when the user first
"logs in" from a non-secure "home pages" on the WWW, and
receives a Bulletin Board display. The second example
shows what happens when the user selects the "Query"
button that is on the Bulletin Board display from the
20 previous example. The third example illustrates what
happens when the user makes a query.

According to the representative embodiment of the present
invention, there are a number of predetermined types of
25 information displays available. A bulletin board display
outputs a list of the headlines of reports that have
recently been received by the repository server 2. (In
these examples, "recently received" is defined to mean
reports that have been received that day, e.g., since
30 midnight on today's date.). The bulletin board display
can include the time of submission of the report by the
contributor, the identity of the contributor, the number
of pages and size of the report, ticket symbols related
to the report, whether a synopsis is available and the
35 headline, all displayed one line per report. A query
results display comprises the same fields of information,
but for reports that satisfy a user's query. Each of the

above two types of output can be displayed in other formats, e.g., in long form which includes a two or more line output for each report listing the headline, the time of submission of the report by the contributor, the identity of the contributor (company), the name(s) of the authors of the report, the number of pages and size of the report, ticket symbols related to the report, whether a synopsis is available. A summary display outputs a three column table, each row listing a contributor, the number of research documents at the repository server 2 available for that user from that contributor and the number of morning notes at the repository server 2 available for that user from that contributor.

15 Example 1: Logging In, and Getting a Bulletin Board

If a user has accessed an initial non-secure home page of the present invention, the user can select a link to "Log In". The actual link is to an address
"/SCGIBIN/result.exe", where "result.exe" is the name of the CGI program that generates response pages to user actions. The directory /SCGIBIN is actually mapped on the non-secure web server to the directory /CGIBIN on the secure web server 4. This means that home pages are handled by the non-secure server, but actual access to reports is handled by the secure web server 4. When the secure web server 4 receives the request to run "result.exe", the web server 4 first checks the request to ensure that the Internet browser making the request is authorized to access the web server 4. If the Internet browser is not authorized, the web server 4 prompts the Internet browser to ask the user, via a dialog box, for a valid user ID and password.

In this example, the user enters the name "george@1984", and the password "wombat" and then selects OK. The web server 4 now verifies that the user is authorized. This is done by passing control to a subroutine named

"mxp_auth()" which consults the relational database's 11 list of valid users and their passwords. (In this example, the relational database 11 is an SQL server.) If the given user ID and password matches a database entry, the subroutine sets up the environment variables HTTP_CID as "1984" to represent the company ID of the user (taken from the "@1984" part of his ID), HTTP_UID as "2096" to represent the user's internal ID (taken from the SQL sever's records), and HTTP_MXP as "wombat" to 5 represent the user's password. The subroutine then returns a REQ_PROCEED value, and the web server 4 knows it may then proceed handling the user's request to run "result.exe".

15 The web server 4 next executes the program "result.exe", with no additional arguments, because none were specified in the hypertext link to it, and because the page that the request was made from was not an HTML form, which would have named data fields the user could fill in to modify the request. First, "result.exe" verifies that 20 the user is not attempting access with the same ID that another user is using. So "result.exe" retrieves the value of the environment variable "HTTP_COOKIE" which is provided by the web server 4 (from the HTTP "Cookie" value in the request from the Internet browser).

25 "result.exe" attempts to find a value in the cookie named "mxauth". Since, in this example, this is the first time this user/browser has "logged in", the "mxauth" value in the cookie has not been set, so "result.exe" grants this user access, generates an authorization string for this 30 user, stores the string where it can find it later, and outputs a cookie value to the web server 4 that the server will send back to the Internet browser.

35 The next thing "result.exe" does is to determine what type of request the user made when calling "result.exe". Since there are no arguments to "result.exe", and there

are no HTML form values, "result.exe" defaults to generating a Bulletin Board, which is a list of all headlines that have newly arrived at the repository server 2 today. The program has a choice of which type
5 of database server to query for the list -- the SQL server 11, and the full-text search server 13. Since this request does not require any full-text searching for values in documents, the "results.exe" program chooses to contact an SQL server 11. If the connection fails for
10 some reason, the program will attempt to contact each backup SQL server until there are no more to connect to. The program will then fall back to attempting to contacting the full-text search servers 13 until it finds one that is up. Failure to find any available servers
15 will result in generation of an error message, and termination of the program.

For the sake of this example, we will assume that "result.exe" successfully connected to the SQL server 11.
20 This particular request would have no parameters, except for specifying that only documents that have arrived on the SQL server 11 since midnight are desired. The request for the document headlines is immediately submitted to the SQL server 11, which returns its results
25 asynchronously. This allows the SQL server 11 to begin processing the request, while "result.exe" moves on to its next step. This next step is to open an HTML template that is appropriate to the output requested by the user. In this case, "result.exe" is generating a
30 simple Bulletin Board, so it is programmed to select a template named "BBOARDR?.tpl". The question mark in the name is filled in by the format that the user prefers his headlines to be displayed in. Possible formats are double line output (? = 'D'), list output (? = 'L'), and
35 table output (? = 'T'). The formats that each user prefers are stored in the same place that the user's authorization code for the cookie is stored. The

"result.exe" program goes to that storage area, looks up the preferred format for "george@1984", discovers it is "L", and finishes its template selection by opening the file "BBOARDRL.TPL". (Of course, other possible formats could be specified and used.)

The template file is mostly HTML, with some RAL elements mixed into it. The "result.exe" program will read through this template, and will immediately output any straight HTML to standard output, which the web server will then send on to the Internet browser for the Internet browser to display as a page on the screen of the user's user computer. However, the RAL elements will cause "result.exe" to insert various pieces of information into this stream of output at appropriate places, formatted according to the contents of the element. Show below is an annotated "BBOARDRL.TPL", indicating in italics what happens at certain RAL elements. (Note that, as above, elements begin with the characters "{mx".)

```

<HTML>
<HEAD>
<TITLE>
25 Bulletin Board
</TITLE>
</HEAD>
<BODY BGCOLOR="ffffff">
<nobr>

```

30

The next line, though has an RAL element that gets its value from the initialization file that "result.exe", named "webpubl.ini". The dollar sign before "webserver" indicates that "result.exe" should look up the JNI entry named "webserver", and substitute its name here in the HTML.

35

```

<h2> <A HREF="{mx name=$webserver} /home/imagemap/mxnetlog.map">
<IMG SRC="/home/gif/mxnetlog.gif" BORDER=0 ALT="Service Name" ISMAP>
</A> <i>
Bulletin Board
40 </h2> </i>

```

```

</nobr>
<form method="POST" action="/CGIBIN/result.exe">
< nobr>
<input type="submit" name="subaction" value="Refresh">
5 <input type="submit" name="subaction" value="Query">
<input type="submit" name="subaction" value="Summary">
<input type="submit" name="subaction" value="AM Notes">

```

10 *The next lines are conditional, depending on whether the "total" number of headlines returned from a headline list query is greater than the "maximum" number that "result.exe" has been configured to display. When "result.exe" is confronted with resolving the value for "total", it first checks to see if it has that value yet. If not, it then goes into a waiting mode, while it waits for that value to arrive asynchronously from the database server 11, 13. Once the total arrives (which it does independently of the actual headline records), "result.exe" proceeds with evaluating this "if"*

15 *condition. If the evaluation is false, then all text until the next "endif" is ignored.*

```
{mx -if total > maximum}
```

20 *In this example one, the total number of headlines returned is 143, while the value set for "maximum" is 100. So this condition is true, meaning the next line gets evaluated and sent out. The element named "changeviewmode" is intended to generate text for a button that the user can press to change from viewing only 100 headlines, to view all of them. So this element's value will become*

25 *"View All 143".*

```

<input type="submit" name="subaction" value="{mx name=changeviewmode}">
{mx -endif}
<input type="submit" name="subaction" value="Long Form">
30 <input type="hidden" name="current" value="bboard">

```

35 *The next line has the element "docsshown". This evaluates to a phrase that tells the user what he is being shown. In this case, the element's value is "Latest 100 of 143 documents". These values depend on the total number of records, the maximum, and whether the user presses the "changeviewmode" button later, in which case it would show "143 documents".*

```

<br> <font> <b> {mx name=docsshown} </font> </b> <br>
</nobr>
40 </form>
<PRE>
<B> Submit Company      Pgs Size Symbol      Syn Headline
</B>

```


The next line actually does not contain any line breaks until the `</PRE>`, but it is wrapped it here for clarity. The first element "`{mx start=documents}`" marks the beginning of a loop, causing "result.exe" to repeat this section through the "`{mx end=documents}`" as long as there are headline records in the result from the query. All the elements in between are involved in displaying fields of the headline records, and in two cases, they are used to establish hypertext links to "result.exe" with arguments that display document synopsis and document contents. Of particular interest here, is that "result.exe" will access the headline records as they arrive asynchronously from the database server 11, 13, displaying them as soon as they arrive. The entire result set of the query does not have to be present for display to start, thus making the display to the user appear faster. In fact, the server is programmed to break the query to it up into pieces if sorting the results will be a lengthy process, as discussed above in the section titled "Optimizations". When a query is broken up, the most recent headlines are accessed first, which is the order that they are shown in this list. In addition, "result.exe" makes certain that the data is being sent to the server (and therefore to the user) by flushing its output queue every 5 headlines.

```

20 <HR> {mx start=documents}{mx name=updatedate width=7} {mx
name=contributor width=20} {mx name=pagecount width=3 align=right} {mx
name=bytecount width=4 align=right} {mx name=symbols width=10} {mx -if synopsis
== 1} <A HREF="result.exe?subaction={mx name=synfile}"> (mx
-endif)(mx name=synopsis width=3) </A> <A HREF="result.exe?subaction={mx
name=docfile}"> {mx name=headline} </A>
25 {mx end=documents} </PRE>
<b>

```

The next lines display counts of the documents, broken down by report type (e.g., here, research documents and morning notes.) Some of the output is conditional, depending on a zero value.

```

{mx name=research} Research Documents<br>
{mx name=morningnotes} Morning Notes
{mx -if morningnotes > 0}
35 -- Click the "AM Notes" button to access them.
{mx -endif}
<br>
</b>

```

It is convenient to have the action buttons also at the end of a long list of documents, but it looks unprofessional to have two sets of buttons with a short list of documents. So the next section that displays buttons is identical to the button display section above, except that it is conditional on how many research documents were actually displayed.

```

(mx -if research > 17}
<hr>
<form method="POST" action="/CG1B1N/result.exe">
<nobr>
5  <input type="submit" name="subaction"
   <input type="submit" name="subaction"
   <input type="submit" name="subaction"
   <input type="submit" name="subaction"
   {mx -if total > maximum}
10 <input type="submit" name="subaction"
   {mx -endif}
   <input type="submit" name="subaction" value="Refresh">
   value="Query">
   value=" Summary">
15 value="AM Notes">
   value="{nm name=changevieWmode}">
   value="Long Form">
   <input type="hidden" name="current" value="bboard">
   </nobr>
20 </form>
   {mx -endif}
   </BODY>
   </HTML>

```

25 The preceding example generates a page 100 for display on the user's Internet browser at the user's user computer 6, 8 as shown in Fig. 2. (The graphic listing the service name is not shown.)

30 The page 100, displayed in bulletin board format, includes a number of action buttons 120-130, and a list of reports. The action buttons 120-130 are all used as commands to "result.exe". Each report is listed on a single line, with information about the report including

35 the time of submission of the report by the contributor (102), the identity of the contributor (104), the number of pages (106) and size of the report (108), ticket symbols related to the report (110), whether a synopsis is available (111) and the report's headline (112). The

40 user can select (e.g., click on) a headline and have the

complete report transferred from the repository server 2 to the user computer 6, 8. The user can select an entry in the synopsis column and have the synopsis displayed.

5 A refresh button 120, if selected, cause this same report to be regenerated, e.g., to include any new reports received since the this page 100 was generated. A query button 122, if selected, causes a query form to be generated, as explained in example 2 below. A summary
10 button, if selected, causes a summary report to be generated. The summary report comprises a three column table, each row listing a contributor, the total number of research documents at the repository server 2 available for that user from that contributor and the
15 total number of morning notes at the repository server 2 available for that user from that contributor. An AM Notes button 126, if selected, causes only morning notes to be displayed. A View All button 128, if selected, causes all headlines to be displayed, regardless of how
20 many. A long form button 130, if selected, causes a page to be generated that includes a two lines for each report, listing the headline, the time of submission of the report by the contributor, the identity of the contributor (company), the name(s) of the authors of the
25 report, the number of pages and size of the report, ticket symbols related to the report, whether a synopsis is available.

A summary line 132 shows the total number of documents
30 that satisfy the query (in this case, all documents that arrived at the repository server 2 since midnight) and the total number displayed.

Example 2: Requesting a Query Form

35 In the preceding example, the user "logged in" and was presented with a Bulletin Board. If the user wishes to make a query for documents that match certain criteria,

he may then click the query button 122 on the Bulletin Board. This causes the Internet browser to form a request to the web server 4 to run "result.exe" again, but since the button is inside an HTML form, additional
5 information is included in the request.

First, when the request arrives at the web server 4, the ID is verified in the same manner described in the prior example, except that the dialog box for user name and
10 password is not displayed, since the Internet browser provides that information as part of the request. Once the user is verified, the web server 4 start running "result.exe", but with input that indicates the "Query" button was selected on the previous form.

15 The first thing "result.exe" does is to try to verify that the user is not attempting access with the same ID that another user is using. The "result.exe" program retrieves the value of the environment variable
20 "HTTP_COOKIE" which is provided by the web server 2 (as received from the HTTP "Cookie" value in the request from the Internet browser). The "result.exe" program attempts to find a value in the cookie named "mxauth". Since this is NOT the first time this user/browser has logged in,
25 the "mxauth" value in the cookie is set to the value "result.exe" gave this user last time he was authorized. The "result.exe" program compares this value to the current authorization code it has stored for this user, and if the two do not match, it generates output that
30 tells the user that access has been denied. If the values do match, then "result.exe" proceeds.

By looking at the value for the CGI form variable "subaction", the "result.exe" program can determine that
35 the user selected the query button 122 on his last request. At this point, the program selects an HTML template appropriate to this request, which is named

"RESULTQ.TPL". To service a query form, "result.exe" connects to the appropriate database server 10, 13 as described in example one. Once connected, it then opens the HTML template, and starts generating output.

5

An annotated version of the "RESULTQ.TPL" template is shown below.

```

10  <html>
    <head>
    <title> Document Query </title>
    </head>
    <body BGCOLOR="#ffffff">
    <nobr>
15  <h2> <A HREF="{mx
    name=$webserver}/hcyme/imagemap/mxnetlog.map"> <IMG
    SRC=91/home/gif/mxnetlog.gif" BORDER=0 ALT="Service Name" 1SMAP> </A>
    <i>
20  Document Query
    </h2> </i>
    </nobr>
    <nobr>
    <form method="POST" action="/CG1B1N/result.exe">
25
        Generate the buttons for commands to be executed from this form.

        <input      type="submit"      name="subaction"    value="Submit">
        <input      type="submit"      name="subaction"    value="Count Only">
30  <input      type="submit"      name="subaction"    value="Summary">
        <input      type="submit"      name="subaction"    value="AM Notes">
        <input      type="submit"      name="subaction"    value="Reset">
        <input      type="submit"      name="subaction"    value="BBoard">
        <input type="hidden" name="current" value="query">
35  </nobr>
    <table>
    <tr  valign="top">
    <td  width=90> <b> Symbol: </b> </td>

```

40

The element here is evaluating the value for "-ticker". Any element name that begins with an underscore is taken from values that are given to "result.exe" as input from the last form that started "resultexe". If the last form had a field (text, list box, hidden, or

otherwise) named "ticker" (no underscore), then the web server 4 would start this instance of "result.exe" with an input field named "ticker" whose value would be the value in the "ticker" field in the last form. If the last form had a field named "ticker" with a value of "IBM", then this element will generate a default value for this input field of "IBM". This allows "result.exe" to come back to the previous state of this query form, if other forms remember the value for "ticker" in hidden fields.

```
<td> <input type="text" name="ticker" value={mx name=-ticker quotes=1}
> </td>
```

10

```
<td width=86>
<td> <input type="submit" name="subaction" value="Symbol Guide"> </td>
</tr>
</table>
```

15

```
<table>
<tr valign="top">
<td width=90> <b> For Period Of: </b> </td>
```

20

The following list box has one value preselected, due to the "match" and "true" parts in the elements within it. These elements evaluate the value for the field "date" from the last form, and if the value matches the value given for the "match" part, then the displayed value for the element will be contents of the "true" part of the element, in this case, the word "selected". In other words, for each one of these lines, you could read "If the last form's date field matches X, then display the word 'selected'". The special case for "Last 7 Days", where the match value is ",3", simply means that if the date value is either empty, or the number three, it is a match.

25

```
<td> <select name="date">
<option value="0" {mx name=_date match=0 true=selected} > Today
30 <option value="1" {mx name=_date match=1 true=selected} > Last 2 days
<option value="2" {mx name=_date match=2 true=selected} > This Week
<option value="3" {mx name=_date match=,3 true=selected} > Last 7 days
<option value="5" {mx name=_date match=5 true=selected} > Last 14 days
<option value="7" {mx name=_date match=7 true=selected} > This Month
35 <option value="8" {mx name=_date match=8 true=selected} > Last 30 days
<option value="12" {mx name=_date match=12 true=selected} > Last 60 Days
<option value="13" {mx name=_date match=13 true=selected} > Last 90 Days
<option value="10" {mx name=_date match=10 true=selected} > All Dates
<option value="-1" > =====
```

40

```
</select> </td>
</tr>
</table>
<table>
```

```

<tr>
</tr>
</table>
<table> <tr valign="top"> <td width=90> <b>Keywords: </b> </td>

```

5

Here, a default value for this field is based on the "query" field in the last form.

```

<td> <input type="text" name="query" size=49 value={mx name=_query
quotes=1} > </td> </tr>

```

10

```

</table>
<table>
<tr valign="top"> <td width=90> <b>Contributors: </b> </td>
<td> <SELECT NAME=contributors SIZE=6 MULTIPLE>

```

15

This is a possible default selection, the same as described above for "date."

```

<OPTION VALUE="-1" {mx name=-contributors match=, -1 true=selected}> [ All
Contributors ]

```

20

This element marks the beginning of a loop on contributors. When this element is evaluated, "result.exe" forms a query to the server that will return a list of all document contributors (companies) that this particular user is entitled to read documents from. The request is asynchronous, so as each contributor record is returned from the server, "request.exe" can fill in the inside of this loop. Inside the

25

```

{mx start=contributorlist}
30 <OPTION VALUE={mx name=contributorid match=_contributors true="%s
selected" false="%s"}> {mx name=contributorname}
{mx end=contributorlist}
<OPTION
VALUE="2"> =====
35 =====

```

```

</SELECT>

```

```

</td> </tr>

```

```

<tr valign="top"> <td> <b>Industries: </b> </td>

```

```

<td> <SELECT NAME=industries SIZE=6 MULTIPLE>

```

40

```

<OPTION VALUE="-1" {mx name=_industries match=, -1 true=selected}> [ All
Industries ]

```

This element and the following loop is the same as the contributor loop above, except it

lists the industries that the user may choose as selection criteria for documents, instead of contributors.

```

{mx start=industrylist}
5  < OPTION VALUE={mx name=industryid match=_industries true="%s selected"
false="%s"} > {mx name=industryname}
{mx end=industrylist}
< OPTION
VALUE="2" > =====
10 </SELECT>
</td> </tr>
</table>
<hr>

```

15 *These buttons are duplicates of the ones above -- we found it was convenient to have them here too.*

```

<input      type="submit"      name="subaction"    value="Submit">
<input      type="submit"      name="subaction"    value="Count Only">
20 <input      type="submit"      name="subaction"    value="Summary">
<input      type="submit"      name="subaction"    value="AM Notes">
<input      type="submit"      name="subaction"    value="Reset">
<input      type="submit"      name="subaction"    value="BBoard">
<input      type="hidden"      name="current"      value="query">
25 </form>
</body>
</html>

```

30 The preceding example generates a page 200 for display on the user's Internet browser at the user's user computer 6, 8 as shown in Fig. 3. (The graphic listing the service name is not shown.)

35 Using the document query page 200, the user can specify parameters for a search of reports located at the repository server 2. The user can specify one or more of the following parameters: symbol (202), period of time, from a drop down list box (204), keywords, and logical joins thereof (206), contributors (208), and industry groups (210). A symbol guide 220 is available if the user does not know a stocks ticker symbol, etc.

A partial list of the HTML generated for the contributors list box (208) is shown below:

```

5  <SELECT NAME=contributors SIZE=6 MULTIPLE>
    <OPTION VALUE="-1" selected> [ All Contributors ]
    <OPTION VALUE=42> Adams, Harkness & Hill
    <OPTION VALUE=47> Alex Brown & Sons
    <OPTION VALUE=128> Auerbach Grayson & Co., Inc.
    <OPTION VALUE=53> Brown Brothers Harriman & Co.
10  <OPTION VALUE=109> Chicago Corporation
    <OPTION VALUE=157> Closed End Fund Digest
    ...
    ...
    <OPTION VALUE="-2"> =====
15  </SELECT>

```

A submit button 212 allows the user to submit the query, as discussed in detail in example three below. A count only button 214 allows the user to request a count of all documents available to that user that satisfy the query parameters. A reset button 216, if selected, clears the form. A BBoard button, if selected causes a bulletin board to be created for the user, as per the first example above.

25

Example 3: The User Makes a Query

In the preceding example, the user requested a form from which he could make a query. This example will step through the user's actions, and the result it produces.

30

For this example, assume that the user has decided to select documents from Alex Brown & Sons, released over the last 30 days, that have the phrase "strong buy" in them. To do this, in the query form, the user selects the "Last 30 Days" item in the period of time combo box 204, enters "strong buy" (quotes included, to indicate a phrase instead of two independent words) in the keywords edit window 206, and selects "Alex Brown & Sons" in the contributors list box 208. To get the list of headlines

that match this request, the user selects the submit button 212.

The request that goes to the web server 4 at this point is to run "result.exe" again, but there is additional information about date, keywords, and contributors in the request. Fields are also defined for industries and ticker symbols, but they are empty fields because the user did not specify anything for them. After the web server 4 verifies the user (as described above), it starts the "request.exe" program with these form fields as additional input.

The "request.exe" program determines from the input fields that a specific query is desired, and from the value of the "subaction" field (button 212) that the user wants a headline list, as opposed to a simple headline count, or a headline summary. The "request.exe" program selects the HTML template "RESULTRL.TPL", choosing the list format output (indicated by the "L" at the end of the file name) for just as it did for the first example. It constructs a headline query based upon the input fields for date, contributor, and keywords. It then submits the query to the full-text search server 13 (since there are keywords specified in the query). It then opens the HTML template, and fills in the elements from the result set of the query, in the same manner as for the Bulletin Board in the first example.

The resulting page 300 generated for display on the user's Internet browser at the user's user computer 6, 8 as shown in Fig. 4. (The graphic listing the service name is not shown.) The page is similar in many respects to that shown in Fig. 2. A score column 402 shows a relevancy score. The summary line 404 shows the total number of documents that satisfy the query, the total number displayed and query search parameters.

The user may then select a document by clicking on the document's headline. The document transfer process takes place as follows: The web server 4 issues a request to the relational database 11 asking whether the user is permitted to view the selected document. Assuming that the selected SQL server is available (if not, the backup procedure described above takes place), then the SQL server returns whether the use is so permitted. If the user is not permitted, then the web server 4 generates a HTML page using an error template. If the user is permitted, the requested document file is opened, the web server 4 generates the appropriate HTTP header and outputs it to STDOUT, and the document file is read and its contents is output to STDOUT. At the user computer 6, 8, the Internet browser program launches a helper application to allow the user to read, print and save the document.

Although the invention has been described with reference to a particular embodiment and arrangement of parts, features and the like, the above disclosure is not intended to exhaust or limit all possible embodiment, arrangements or features, and indeed, many other modifications and variations will be ascertainable to those skilled in the art.

For example, the central site 1 may distribute reports by other networks in addition to the Internet. Fig. 5 illustrates an enhanced system architecture according to the present invention. In the enhanced system, the central site 1 is also coupled to one or a number of viewer servers 30, 32. Typically, the viewer servers 30, 32 are located at a remote location with respect to the central site 1 and are coupled to the central site 1 over a proprietary network. Each viewer server 30, 32 includes a database 40, 42 and is coupled to one or a number of viewer workstations 34, 36, 38. The viewer

workstations 34, 36 execute the Acrobat Exchange program, available from Adobe Systems, and the Multex Publisher™ Research Viewer program, by Multex Systems, Inc. The central site 1 maintains a distribution list that lists which viewer servers 30, 32 are permitted to receive reports from which contributors. (As a simple example, if viewer server A 30 is located at company ABC, Inc. and viewer server B 32 is located at company RST, Inc., then, for a particular report, the repository server may distribute the report to viewer server A 30 but not viewer server B 32.) When a report is received by the central site 1, the central site 1 transmits a task to each viewer server 30, 32 that is permitted to receive that report that a new report has arrived, and the permitted viewer servers 30, 32 executes the task to "pull" that report from the central site 1 and store it in their respective databases 40, 42. The viewer server 30, 32 will then cause the title of the report to be displayed on viewer workstations 34, 36, 38 that are used by investors who are permitted (as determined by the distribution level set by the contributor). Investors can also issue queries to the viewer server's database, which will return titles of relevant reports. The investor may then request a report, which is "pulled down" from the viewer server 30, 32 to the requesting viewer workstation 34, 36, 38.

It is noted that the web server 4 and repository server 2 of the representative embodiment of the present invention can be implemented utilizing a logic circuit or a computer memory comprising encoded computer-readable instructions, such as a computer program. The functionality of the logic circuit or computer memory has been described in detail above. Generally, the present invention has practical application as it enables reports and other information to be distributed speedily and searched efficiently by authorized users in remote

locations.

Thus, the above described embodiments are merely illustrative of the principles of the present invention.
5 Other embodiments of the present invention will be apparent to those skilled in the art without departing from the spirit and scope of the present invention.

WHAT IS CLAIMED IS:

1. A computer-implemented system for the secure electronic distribution of research documents over the world wide web to investors who are authorized to receive said research documents, comprising:

a repository server receiving from a plurality of contributors a plurality of research documents in electronic form and a plurality of corresponding document profiles comprising information relating to each research document including authorization information specifying who is permitted to access each research document, the repository server including a first database for structured query searches storing the information from the plurality of document profiles and a second database for full text searches storing searchable full text of the plurality of research reports; and

a web server coupled to the repository server and coupled to the world wide web, the web server receiving a request from an investor for research documents that satisfy a query, the web server determining whether the first database or the second database should be searched based upon the type of query and thereafter requesting that the repository server query said determined database and transmit to the web server a list of research documents that satisfy the query and which the investor is authorized to access according to the authorization information, the web server thereafter formatting the list of documents according to a template form and transmitting the formatted list of documents to the investor.

2. The system of claim 1 wherein the template form is selected by the investor.

3. The system of claim 1 wherein the template form is selected by the web server according to the identity of

the investor.

4. The system of claim 1 further comprising a user computer used by the investor and executing a browser program, the user computer coupled to the world wide web.

5. The system of claim 4 wherein the query is formulated by the investor at the user computer.

6. The system of claim 1 further comprising a plurality of contributor workstations, each coupled to the repository server, for transmitting to the repository server the plurality of research documents and the plurality of corresponding document profiles.

7. A computer-based system for the secure electronic distribution of documents over the world wide web to users who are authorized to receive said documents, comprising:

- a plurality of templates, each template specifying an output format;

- means for receiving a plurality of documents in electronic form from a plurality of contributors;

- means for receiving a plurality of document profiles from the plurality of contributors, each document profile corresponding to one of the plurality of documents and comprising information related to said one of the plurality of documents;

- means for receiving authorization information for each one of the plurality of documents, the authorization information defining who is authorized to access said document;

- means for converting the plurality of documents into a common format;

- means for storing the plurality of documents in said common format;

- a relational database for storing the plurality of

document profiles and the authorization information;

means for extracting text from the plurality of documents;

a full text database for storing the extracted text;

means for receiving a user identification code from a browser program of remote user;

means for blocking simultaneous use of the user identification code with automatic re-enablement after a predetermined period of inactivity from the user identification code;

means for submitting an initial query to the relational database for all documents the remote user is authorized to access and that were received from contributors during a previous preset time period;

means for transmitting results of queries to the browser program for display according to the format specified in one of the plurality of templates;

means for enabling the remote user to submit queries;

means for determining if a submitted query includes a text search parameter, and if so, routing said query to the full text database, and if not, routing the query to the relational database; and

means for executing the submitted queries by selecting all documents the remote user is authorized to access and that satisfy the submitted query.

8. A computer-based system for the secure electronic distribution of research documents over the world wide web to investors who are authorized to receive said documents, comprising:

a plurality of templates, each template specifying an output format;

means for receiving a plurality of research documents in electronic form from a plurality of contributors;

means for receiving a plurality of research document

profiles from the plurality of contributors, each research document profile corresponding to one of the plurality of research documents and comprising information related to said one of the plurality of research documents;

means for receiving authorization information for each one of the plurality of research documents, the authorization information defining who is authorized to access said research document;

a relational database for storing the plurality of research document profiles and the authorization information;

means for extracting text from the plurality of research documents;

a full text database for storing the extracted text;

means for receiving a user identification code from a browser program operated by a remote user;

means for submitting an initial query to the relational database for all research documents the remote user is authorized to access and that were received from contributors during a previous preset time period;

means for transmitting results of queries to the browser program for display according to the format specified in one of the plurality of templates;

means for enabling the remote user to submit queries;

means for determining if a submitted query includes a text search parameter, and if so, routing said query to the full text database, and if not, routing the query to the relational database;

means for optimizing predetermined queries;

means for executing the submitted queries by selecting all research documents the remote user is authorized to access and that satisfy the submitted query.

9. The system of claim 8 further comprising means for

blocking simultaneous use of the user identification code with automatic re-enablement after a predetermined period of inactivity from the user identification code;.

10. The system of claim 8 further comprising:

means for converting the plurality of research documents into a common format; and

means for storing the plurality of research documents in said common format.

11. The system of claim 8 further comprising:

means for enabling the remote user to select a research document from the results of queries; and

means for transmitting the selected document to the remote user's browser program.

12. A computer-implemented system for the secure electronic distribution of research documents over the world wide web to investors who are authorized to receive said research documents, comprising:

a repository server receiving from a plurality of contributors a plurality of research documents in electronic form and a plurality of corresponding document profiles comprising information relating to each research document including authorization information specifying who is permitted to access each research document, the repository server including a database storing the information from the plurality of document profiles for storing searchable full text of the plurality of research reports; and

a web server coupled to the repository server and coupled to the world wide web, the web server receiving a request from an investor for research documents that satisfy a query, the web server requesting that the repository server query said database and transmit to the web server a list of research documents that satisfy the query and which the investor is authorized to access

according to the authorization information, the web server thereafter formatting the list of documents according to a template form and transmitting the formatted list of documents to the investor.

13. A computer-implemented system for the secure electronic distribution of research documents over the world wide web to investors who are authorized to receive said research documents, comprising:

a repository server receiving from a plurality of contributors a plurality of research documents in electronic form and a plurality of corresponding document profiles comprising information relating to each research document including authorization information specifying who is permitted to access each research document, the repository server including a first database for structured query searches storing the information from the plurality of document profiles and a second database for full text searches storing searchable full text of the plurality of research reports; and

a web server coupled to the repository server and coupled to the world wide web, the web server receiving a request from an investor for research documents that satisfy a query, the web server determining whether the first database or the second database should be searched based upon the type of query and thereafter requesting that the repository server query said determined database and transmit to the web server a list of research documents that satisfy the query and which the investor is authorized to access according to the authorization information, the web server thereafter transmitting the list of documents to the investor.

14. A system for creating a web page including search results arising from a database query, comprising:

a web server including an output channel coupled to the Internet;

a plurality of templates, each template specifying an output format and including one or more elements;

a database program coupled to the web server;

means for selecting one of the plurality of templates;

means for receiving search results from the database program;

means for sequentially passing the contents of the selected template to the output channel until an element is reached;

means for processing an element in the selected template in combination with the search results according to a set of predetermined rules;

means for passing the output of the processing step to the output channel;

means for flushing output channel at predetermined intervals.

15. A method to determine whether a user is authorized to access a secure server from a remote computer where the secure server does not require that the user logs off, comprising:

receiving a user identification code from the remote computer;

verifying the user identification code against a database of authorized users;

if verified, providing the remote computer with a verification signature;

transmitting state information to the remote computer for storage at the remote computer, the state information including an authorization variable;

receiving a request for information from the remote computer, the request including the verification signature;

validating the verification signature;

receiving the state information from the remote computer;

retrieving the authorization variable from the state information;

if the authorization variable is empty, providing a new value for the authorization variable, storing the new value as associated with the user identification code at a central location, and transmitting the new value to the remote computer; and

if the authorization variable is not empty, determining if the value of the authorization variable retrieved from the state information matches a value for the authorization variable stored at the central location associated with the user identification code, and if there is a match, processing the request for information.

16. The method of claim 15 further comprising the final step of denying access if the value of the authorization variable retrieved from the state information does not match the value for the authorization variable stored at the central location associated with the user identification code.

17. The method of claim 15 wherein the user identification code comprises a user ID and a password.

18. The method of claim 15 wherein the step of providing a new value for the authorization variable comprises providing a random value for the authorization variable.

19. The method of claim 15 further comprising the step of storing a time of access at the central location along with the value of the authorization variable whenever a request for information is received.

20. The method of claim 19 wherein the step of determining if the value of the authorization variable retrieved from the state information matches a value for the authorization variable stored at the central location

associated with the user identification code further comprises determining that there is a match, regardless of the value of the authorization variable retrieved from the state information.

21. The method of claim 20 wherein the request for information is a request for an investment research report.

22. The method of claim 21 further comprising the step of determining which investment research reports the user is permitted to access.

23. The method of claim 15 wherein the steps of transmitting further comprise transmitting via the Internet.

24. The method of claim 23 wherein the remote computer includes a browser program and wherein the step of transmitting the new value to the remote computer further comprises the step of storing the new value at the remote computer.

25. A method for optimizing search requests received from remote computers operated by users, comprising:
 storing at a central server a plurality of document profiles, each document profile corresponding to a document and comprising information related to the document, including a set of one or more authorization groups for the document, each authorization group corresponding with a contributor of the document;
 for each user, storing at the central server a set of accessible groups specifying which authorization groups of documents the user is permitted to access;
 receiving, at a web server, a search request from a user at remote computer for documents, the search requesting including a limitation that the documents are

from a specified contributor;

 providing the search request to the central server;
 at the central server, creating a first list of groups of documents stored at the central server listing the user's accessible groups that correspond with the specified contributor;

 at the central server, creating a second list of groups of documents stored at the central server listing the groups that are not accessible to the user and that correspond with the specified contributor;

 if the first list is empty, denying the search request;

 if the second list is empty, then constructing a search for all documents of the specified contributor that satisfy the search request; and

 otherwise, determining selecting the shorter of the first list and the second list, and if the shorter list is the first list, then constructing a search restricted to groups in the first list, and if the shorter list is the second list, then constructing a search restricted to groups of the specified contributor not in the second list.

26. The method of claim 25 further comprising the steps of:

 executing the search at the central server;
 providing the search results to the web server;
 formatting the search results at the web server; and
 providing the formatted search results via the Internet to the remote computer.

27. The method of claim 26 wherein the search results comprises a list of documents that satisfy the constructed search.

28. A computer-implemented method for optimizing a query that requests a list of documents sorted by time, the

documents stored in a database, comprising:

providing a first query requesting a list of documents sorted by time and a maximum number of documents;

determining a count of the number of documents that satisfy the first query;

if the count is less than or equal to a predetermined threshold, then execute the first query and return the results;

if the count is greater than a predetermined threshold, then determine if the first query is for documents that are dated within a time range;

if the first query is not for documents that are dated within a time range, then select a default time range as the time range;

create a second query comprising the first query with a restriction for documents dated within a predetermined first portion of the time range;

execute the second query and return the results;

if the number of results returned is less than the maximum number of documents, create a third query comprising the first query with a restriction for documents dated within a remaining portion of the time range; and

execute the second query and return the results.

29. The method of claim 28 wherein the maximum number of documents is set by the user.

30. The method of claim 28 wherein the step of providing a first query requesting a list of documents sorted by time further comprises the step of transmitting the first query over the Internet from a remote user.

31. The method of claim 30 wherein the step of determining a count further comprises the step of providing the count over the Internet to the remote user

as soon as determined.

32. The method of claim 30 further comprising the step of providing results over the Internet to the remote user as soon as partial results are returned.

33. For use at a web server coupled to the Internet and a database program, a method for creating a web page comprising search results arising from a database query, comprising:

- providing a plurality of templates, each template specifying an output format and including one or more elements;

- selecting one of the plurality of templates;
- receiving search results from the database program;
- sequentially passing the contents of the selected template to an output channel until an element is reached;

- upon reaching an element, processing the element and the search results according to a set of predetermined rules;

- passing the output of the previous step to the output channel; and

- repeating the previous three steps until reaching the end of the template.

34. The method of claim 33 further comprising the step of flushing output channel.

35. The method of claim 33 further comprising the step of receiving the database query over the Internet from a remote user.

36. The method of claim 35 wherein the remote user selects the one of the plurality of templates.

37. The method of claim 35 further comprising the

initial steps of:

- receiving a user identification code from the remote user; and

- determining if the remote user is entitled to access the web server.

38. The method of claim 37 wherein the step of providing a plurality of templates further comprises providing a plurality of templates according to the user identification code.

39. A method for the secure electronic distribution of documents over the world wide web to users who are authorized to receive said documents, comprising:

- providing a plurality of templates, each template specifying an output format;

- receiving a plurality of documents in electronic form from a plurality of contributors;

- receiving a plurality of document profiles from the plurality of contributors, each document profile corresponding to one of the plurality of documents and comprising information related to said one of the plurality of documents;

- receiving authorization information for each one of the plurality of documents, the authorization information defining who is authorized to access said document;

- converting the plurality of documents into a common format;

- storing the plurality of documents in said common format;

- storing the plurality of document profiles in a relational database;

- storing the authorization information for each document in the relational database;

- extracting text from the plurality of documents;

- storing the extracted text in a full text database;

- receiving a user identification code from a browser

program of remote user;

blocking simultaneous use of the user identification code;

automatically re-enabling use of the user identification code after a predetermined period of inactivity from the user identification code;

initially, executing a first query to the relational database for all documents the remote user is authorized to access and that were received from contributors during a previous preset time period;

outputting results of the first query according to the format specified in one of the plurality of templates;

enabling the remote user to submit queries;

for each submitted query, determining if the query includes a text search parameter, and if so, routing said query to the full text database, and if not, routing the query to the relational database;

executing the submitted queries by selecting all documents the remote user is authorized to access and that satisfy the submitted query; and

outputting the results of the submitted query according to the format specified in one of the plurality of templates.

40. A computer-based system for the secure electronic distribution of documents over the world wide web to users who are authorized to receive said documents, comprising:

a plurality of templates, each template specifying an output format;

means for receiving a plurality of documents in electronic form from a plurality of contributors;

means for receiving a plurality of document profiles from the plurality of contributors, each document profile corresponding to one of the plurality of documents and comprising information related to said one of the

plurality of documents;

means for receiving authorization information for each one of the plurality of documents, the authorization information defining who is authorized to access said document;

means for converting the plurality of documents into a common format;

means for storing the plurality of documents in said common format;

a first database for storing the plurality of document profiles and the authorization information;

means for extracting text from the plurality of documents;

a second database for storing the extracted text;

means for receiving a user identification code from a browser program of remote user;

means for blocking simultaneous use of the user identification code with automatic re-enablement after a predetermined period of inactivity from the user identification code;

means for submitting an initial query to the relational database for all documents the remote user is authorized to access and that were received from contributors during a previous preset time period;

means for transmitting results of queries to the browser program for display according to the format specified in one of the plurality of templates;

means for enabling the remote user to submit queries;

means for determining if a submitted query includes a text search parameter, and if so, routing said query to the second database, and if not, routing the query to the first database; and

means for executing the submitted queries by selecting all documents the remote user is authorized to access and that satisfy the submitted query.

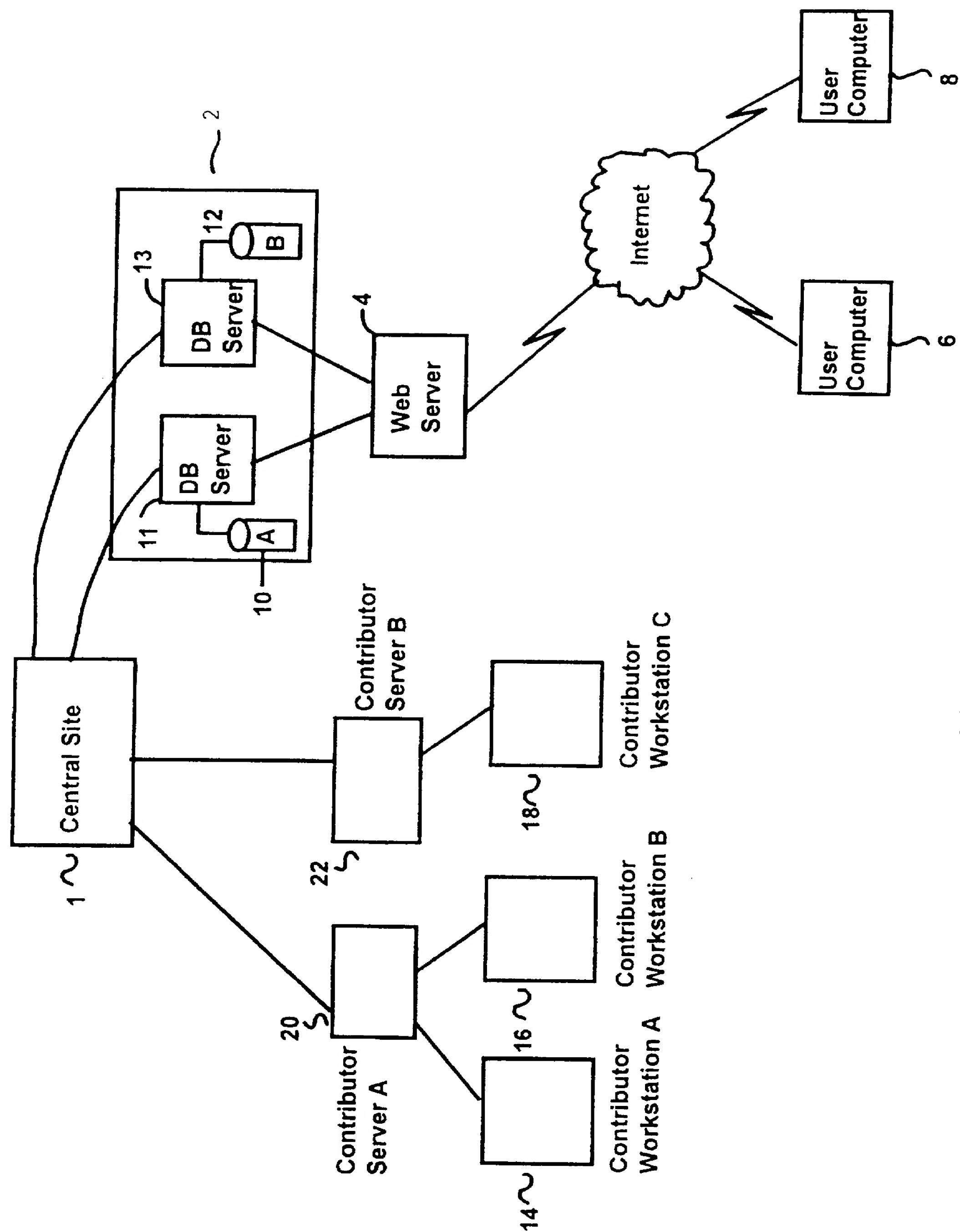


Fig. 1

2/5

Bulletin Board

120 122 124 126 128 130
Refresh Query Summary AM Notes View All 148 Long Form

Latest 100 of 143 Documents 132

Submit	Company	Pgs	Size	Symbol	SYN	Headline
10:41AM	Equitable Securities	3				Roper Industries
10:39AM	Equitable Securities	2	72K			Mid States PLC
10:39AM	Equitable Securities	3	75K			Leggett & Platt
10:37AM	Punk, Ziegel & Kn...	1		HPS	Yes	HealthPlan Service
10:36AM	Merrill Lynch	2	51K	ASDOF		ASSIDOMAN: Strong
10:35AM	Merrill Lynch	2	17K	CNG		CONSOL NAT GAS: A
10:21AM	Merrill Lynch	2	12K			Strategy Updates
10:18AM	Merrill Lynch	6	55K			Daily Optimized, T
10:18AM	ING Barings	6	64K	SKODA...		Eastern Europe Da
10:14AM	Merrill Lynch Test	11		MLNONO		CURRENT RESTRICTI
10:14AM	Janney Montgomery...	2	35K	ADCO		Adco Technologies
10:14AM	Merrill Lynch Test	1		MLN02 4		24-Hour Restrictions
10:14AM	Janney Montgomery...	7	57K			Statistical Pages
10:14AM	Janney Montgomery...	86	469K	ANST M...		Mid-Atlantic Revi
10:04AM	Brown Brothers Ha...	15	172K	CL HNZ...		Colgate-Palmolive
10:02AM	Merrill Lynch	2	52K	HNKDF		HANKYU DEPT.:Lowe

102 104 100 106 108 110 111 112

FIG. 2

212

Submit

214

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124

Summary

126

AM Notes

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Document Query

Symbol:
202

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Of:
204

Keywords:
206

Contributors:
208

Industries:
210

Symbol Guide

220

Last 7 Days

[All Contributors]

Adams, Harkness & Hill

Alex Brown & Sons

Auerbach Grayson & Co., Inc.

Brown Brothers Harriman & Co.

Chicago Corporation

[All Industries]

ADVERTISING

AEROSPACE

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APPAREL & TEXTILES

FIG. 3

SUBSTITUTE SHEET (RULE 26)

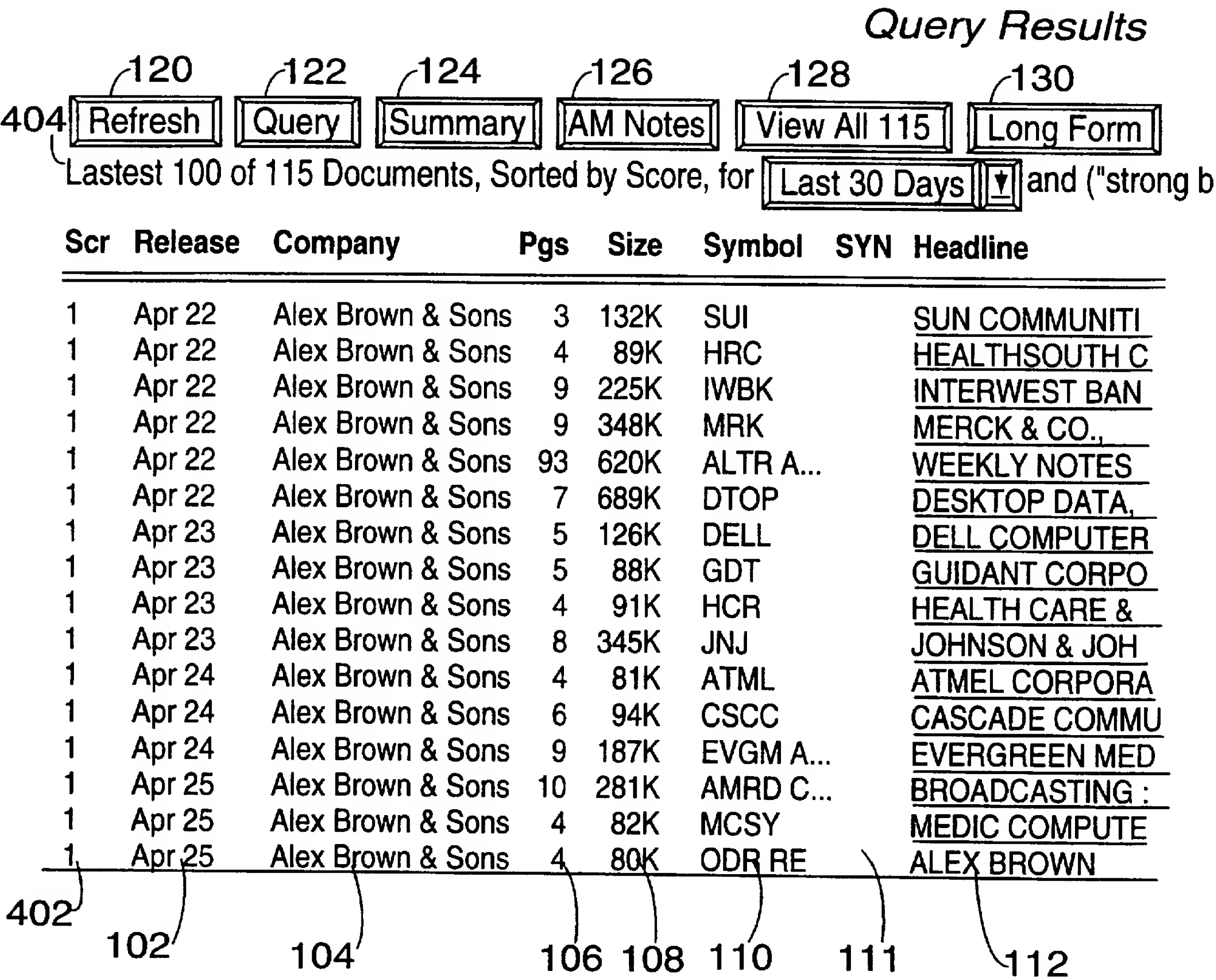
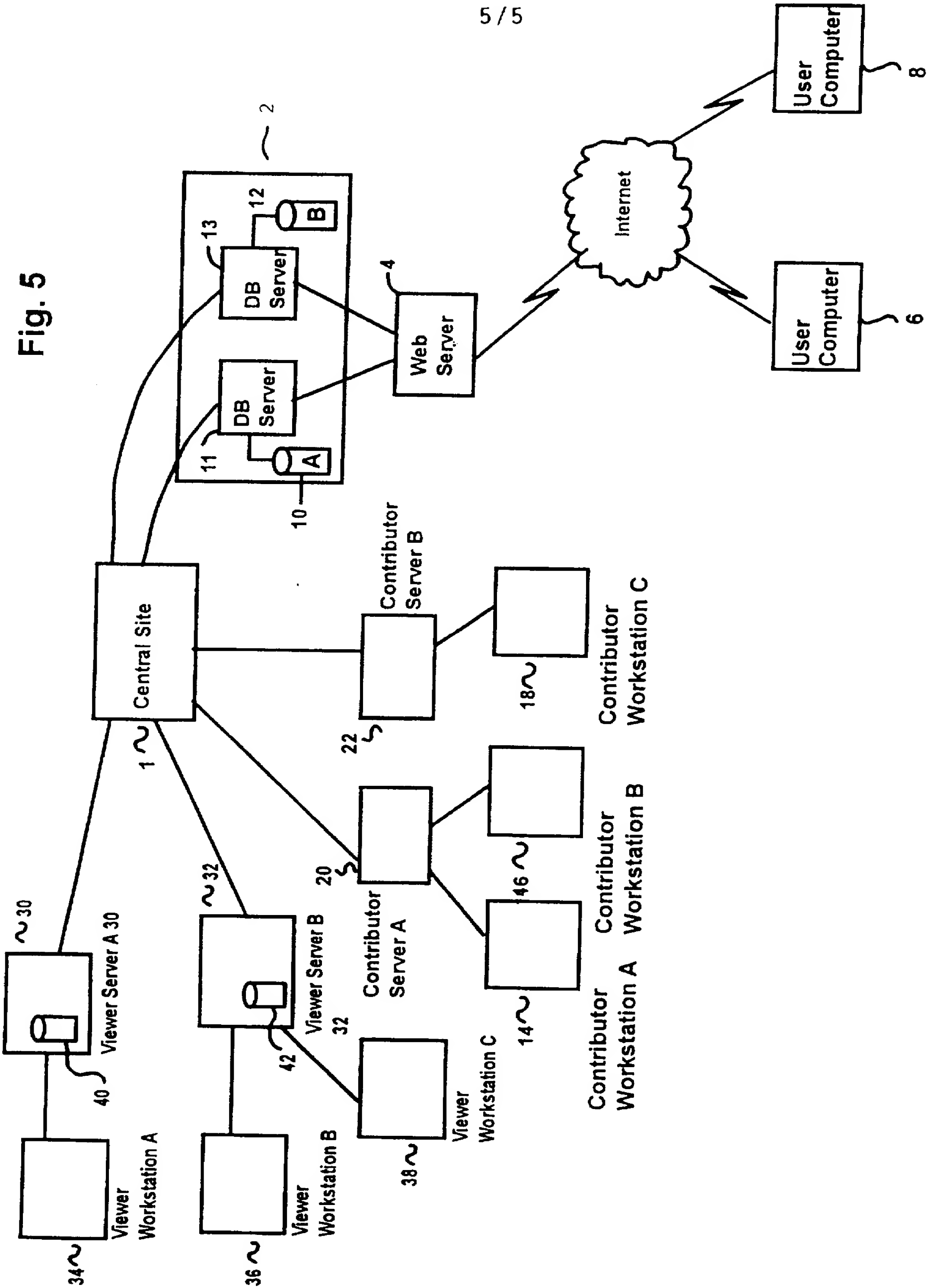


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/10225

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 17/00, 7/00

US CL :395/602, 603, 609, 615; 364/280.5, 280.6, 282.1, 282.4

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 395/602, 603, 609, 615; 364/280.5, 280.6, 282.1, 282.4

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 5,600,831 A (LEVY et al) 04 February 1997, col. 10, lines 17-43 and col. 11, lines 42-63.	1-6, 12-13
A,P	US 5,530,852 A (MESKE, Jr. et al) 25 June 1996, col. 2, lines 22-55 and col. 4, lines 13-60.	7-11, 14-40
A,P	US 5,572,643 A (JUDSON) 05 November 1996, col. 3, lines 44-67 to col.4, lines 1-24.	7-11, 14-40
A,P	US 5,388,196 A (PAJAK et al) 07 Feb 1995, col. 1, lines 18-65 and col. 4, lines 33-56.	7-11, 14-40
A	US 5,649,186 A (FERGUSON) 15 JULY 1997, col 1-2, Summary	1-14,33-38

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 29 JULY 1997	Date of mailing of the international search report 24 OCT 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>[Signature]</i> TODD VOELTZ Telephone No. (703) 305-9714

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/10225

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,452,460 A (DISTELBERG ET AL) 19 SEPTEMBER 1995, COL 1-6.	1-24,37-38
Y	US 5,502,637 A (BEAULIEU ET AL) 26 MARCH 1996, COL 1-3.	1-13
X	US 5,502,637 A (BEAULIEU et al) 26 March 1996, Col 1-3	25-27